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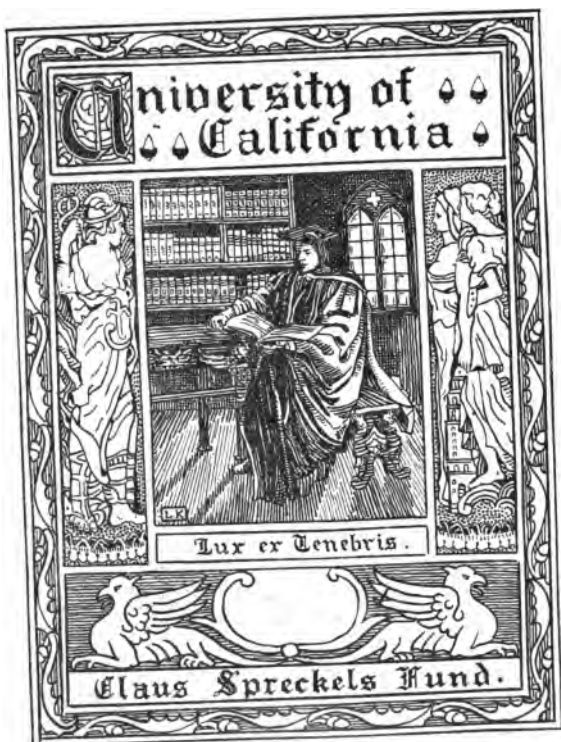


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OF THE
BRITISH EMPIRE

BY
LIONEL W. LYDE

M.A., F.R.S.G.S.

EXTENSION LECTURER IN COMMERCIAL GEOGRAPHY
TO THE UNIVERSITIES OF GLASGOW AND OXFORD
HEADMASTER OF BOLTON GRAMMAR SCHOOL

THIRD EDITION, REVISED



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SPRINGER

"I shall be glad
If all my labours, failing of aught else,
Suffice to make *some* inroad and procure
A wider range for thought."

—*Paracelsus.*

P R E F A C E

THIS volume will be found to consist of two parts—an Introduction, which treats of general principles, and the Application of such principles to the larger areas of the British Empire. Apart from the personal interest of the Empire to ourselves, it may also be looked upon as an epitome of the world.

With this in view, special prominence has been given to special products from different parts of the Globe, *e.g.* Canadian *wheat*; and, in the case of that particular product, I have added a detailed account of the conditions under which it is produced—partly because of the intrinsic importance of the subject in a country which cannot provide its inhabitants with home-grown *bread*, and partly to illustrate a method of treatment which may be applicable elsewhere.

The study of Geography from the economic point of view is of great moral and social importance, for it is essentially concerned with the production of *necessaries*. The Multitude have no leisure; their Standard of Comfort is bare necessity; and their lives are made utterly sordid and sad by the constant struggle with grinding poverty. Consequently, the physical conditions of their lives make moral and mental growth practically impossible. Of course, wheat *could* be grown on Ben Nevis, but only at an enormous expense; and souls *are* saved amid scenes of the deepest want and suffering, but it is—as it were—reaping upon Ben Nevis.

Thus, the production of cheap, good food in abundance has a direct and vital bearing on the leisure and, therefore, on the possible higher development of the Many; and one great obstacle to it at present is ignorance of the Geographical conditions under which necessities of life are produced.

I gladly take this opportunity of acknowledging my long and increasing indebtedness to my former Chief, J. J. Rogerson, Esq., LL.D., of Merchiston Castle, Edinburgh, for his very kind encouragement and valuable advice. Through him I am also indebted to Merchistonians all over the world, from whose conversation or letters to him I have obtained most useful information on Geographical and kindred subjects. I am similarly indebted to my friend, Cyril Harrison, Esq., formerly of Qu'Appelle College, Assiniboia.

PREFACE TO THE SECOND EDITION.

A few misprints have been corrected, and the statistics have been brought up to date; but otherwise no change has been made in the book except the addition of a few facts about some of the smaller British possessions—on page 154.

October 21, 1897.

PREFACE TO THE THIRD EDITION.

The demand for a third edition has given me an opportunity of expanding the sections referred to above on the smaller British possessions, and of adding a short account of the Transvaal and Orange River Colonies.

L. W. L.

November 20, 1900.

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A
COMMERCIAL GEOGRAPHY
OF
THE BRITISH EMPIRE.



PART I.
INTRODUCTION.

COMMERCIAL GEOGRAPHY may be roughly described as a Study of the earth from the standpoint of the ordinary intelligent merchant. What such a man wants to know is—where he can get the largest amount of the usual commodities, in the best condition, at the shortest distance (of time or space), for the least cost, and with the greatest regularity.

The last consideration is the most important, in many ways ; and confidence in the REGULARITY OF THE SUPPLY of any commodity can only come from a thorough knowledge of the conditions under which it is produced. These conditions are investigated by Commercial Geography. It is the office of Commerce to organise all the conveniences

A

and commodities of earth, air, and sea, that affect human life ; and Geography supplies the knowledge of the locality in which these conveniences and commodities are to be found.

HUMAN WANTS, of course, vary. Everywhere air is the first, and food is the second, necessary of human existence. In countries like Great Britain the third necessary is clothing, and the fourth shelter ; but in warmer countries both clothing and shelter become less necessary. This, of course, affects THE MOTIVE TO LABOUR. For instance, the natives of Natal own the huts in which they live, and have small pieces of land attached to the huts. On this land they can feed a few cattle and sheep of their own, and grow as much "mealies" as they want for a year ; and, as their dress is usually limited to a very small apron, there seems to be no particular reason why they should work. A state of matters such as this, is naturally accentuated where, as *e.g.* in Mashonaland, the soil is so extraordinarily fertile that cultivation can be confined to a few scratches with a hoe without any fear that the harvest will fail.

POPULATION.

Men are by nature gregarious animals; and, even if they were not, the complex conditions of modern life would compel them to congregate in a FEW LARGE CENTRES. These conditions involve, amongst many other things, minute subdivision of labour and specialisation, which apply to countries as well as to individuals. Almost all the great industries may, however, be classed under two general heads—agricultural and manufacturing. The former are connected with large areas of fertile soil, which are found mainly on low plains; the latter are connected with rich deposits of coal and iron, which are found mainly in the neighbourhood of mountains. In both cases access to navigable water is an immense advantage.

Of the two the AGRICULTURAL class is much the more important, because the other depends on it directly or indirectly for all its supplies, both of food and of raw material. At the same time, it obviously does not favour the occupation of the ground by dense masses of population; and, therefore, agricultural countries will be less valuable than manufacturing countries as *markets*.

Various causes affect THE DISTRIBUTION OF LABOUR IN MANUFACTURING COUNTRIES. In addition to the local position of the minerals and means of transport, association and heredity, or real and imaginary suitability, or climate and special demands for a particular commodity, all exercise an influence on the direction taken by labour. Some

labourers serve man's higher wants, intellectual and moral ; others perform personal offices for him ; others are engaged on the production of real and "acquired" necessities ; and so on.

In all these spheres it is easier and cheaper to take the labourer to the labour than *vice versa* ; and the MIGRATION may be temporary or permanent. The temporary migrations are usually of unskilled labour, *e.g.* of Irish peasants to England for harvest work ; the permanent migrations are usually from overcrowded to new countries, and take away from the old country the most energetic and daring of her young citizens. These very qualities, however, tend to make the emigrants good customers in their new home ; and ties of blood and sentiment and habit tend to give their mother country much of their custom. "Trade follows the Flag."

The COMMERCIAL IMPORTANCE OF A NATION depends on its industry and intelligence, and these depend largely on its physical conditions. For instance, the rich alluvial soil and the hot enervating climate of the Indus or Euphrates basin make the inhabitants stationary and slavish ; the isolated highlands of Greece or Scotland make the inhabitants vigorous and independent. While the former remain content and insensible to progress, the latter convert their fathers' luxuries into comforts and their fathers' comforts into necessities.

Thus there arises a CLASSIFICATION OF WANTS into real and acquired. Food, warmth, and rest are real necessities ; but the particular items under each head vary, and the standard of necessity is always being raised. For instance, tea and tobacco, glass and gas, papers and pictures, have become necessities to the average Briton ; with the

average Chinaman fish has become a necessary, and he spends his time at home in fishing—with every imaginable device and decoy, by day and by night—and eating fish.

Briefly, then, we may say that the **DENSEST POPULATION** will be found on coal-fields near the sea and on the alluvial soil of tropical river-basins. When the soil of the latter is very fertile, as along the Ganges, the Yang-Tse-Kiang, and the Hoang-Ho, the tendency of agriculture to make a population stationary will be increased ; and the settlement will be very dense. Elsewhere, especially in a Temperate Zone, dense population will mainly be found on coal-fields, as in England, Belgium, Saxony, and Pennsylvania ; and such areas will supply a large overflow for emigration. Even on fertile soil, however, in a Temperate Zone, *e.g.* in Holland and North Italy, the people are compelled to work continuously and energetically ; and, consequently, the exigencies of climate and economic conditions counteract the natural tendency of agricultural pursuits to make people lazy and slavish.

CLIMATE.

Of course, the question of CLIMATE practically decides the distribution of men over the earth. For instance, the islands of the Arctic Archipelago have shores admirably adapted for shipping, soil of great natural fertility, and abundance of mineral wealth ; but the climate makes not only the islands themselves, but also a large part of northern Canada, quite unfit for human habitation. The question arises, then, on what does climate itself depend? The climate of any place depends upon—the build of the country, the distance from and height above the sea, the length of the days and seasons, and the character and condition of the soil. Moreover, climates may be broadly classified under two heads—marine and continental.

1. THE BUILD OF THE COUNTRY.—The rays of the sun have power in proportion to their direction, vertical rays being very much hotter than sloping rays because they are less affected by the atmosphere, and because they are more concentrated. Obviously, therefore, the nearer land is to the Equator, the hotter it ought to be ; but, if a country in any latitude slopes *towards* the sun, it will receive the rays more vertically. Consequently, in the Northern Hemisphere fruit-trees are planted on slopes, or nailed to walls, which look *southward* (*cf.* the Minas apple-orchards in Nova Scotia) ; on the contrary, the Nelson plain, on which the famous New Zealand peaches are grown, looks due *north*.

It is obvious, also, that plains are exposed to the full violence of any winds, hot or cold, but that they exercise

no condensing power on damp winds passing over them. For instance, the level of the land S.E. of the Indus is so low that, though literally 2 or 3 *yards* of rain from the S.W. fall on the *north* frontier of the Punjab, the land in question—over which the rain-clouds have passed—is known as “the Indian Desert.”

2. HEIGHT ABOVE THE SEA.—Temperature varies vertically to the amount of 1° F. for every 300 feet of elevation. For instance, on the Himalayas and the Andes from about 17,000 feet *upward* the mountains are covered with snow and ice; between 15,000 and 17,000 feet only vegetation of the lichen kind will grow; between 13,000 and 15,000 feet mountain grasses begin to flourish; then follows a belt of forest-trees of the kind found near the sea-level in temperate climates; and downwards from about 5000 feet, where this forest belt ceases, the vegetation becomes tropical. This principle is found in operation everywhere; but, of course, distance from the Equator lowers the level of the snow-line—on the Alps to about 8600 feet and on the north of the Kiolen Mountains to about 2000 feet. The future development of Africa largely depends on the extent to which the elevations of the Cameroons, the Atlas, the Drakenberge, and the mountains round the Victoria Nyanza and Lake Nyassa, can be used as sanatoria for white men. Simla has become the sanatorium of Northern India simply because it is 4000 feet higher than the Ganges plain, *i.e.* at least 12° cooler than Lucknow. Mountains, however, also act as a screen against hot or cold winds. For instance, the Apennines, by keeping off the N.E. wind, make the average climate of Naples 10° F. warmer than that of Constantinople, which is in the same latitude.

3. **DISTANCE FROM THE SEA.**—As water heats and cools more slowly than land, it acts everywhere as a moderator of temperature; and, as the sea contains both warm and cold currents, the warming or chilling influences of these currents will be more or less permanent. The Labrador current keeps land in the latitude of Ireland ice-bound for months every year, while the Gulf Stream enables barley to be ripened inside the Arctic Circle in Norway; St Nazaire and Bordeaux are open ports when Astrakhan and Sebastopol are absolutely ice-bound.

Moreover, the character of prevailing winds is modified most beneficially by the presence of water. Winds that blow across water, tend to be warm and wet; winds that blow across land, *must* be dry and of extreme temperature. The S.W. Anti-Tradewinds bring a deluge of rain against the windward side of the Rocky and the Pennine ranges; cold dry winds coming over the vast expanse of northern Canada, bring frost to the wheat fields of Manitoba and terrible snow-storms to the Great Lakes.

4. **DURATION OF SUNSHINE.**—The length of a day varies from a constant twelve hours at the Equator to about eighteen hours in England and six *months* at the Poles; and the quantity of heat largely compensates for the quality. Thus, though the warmth of the sun's rays is *halved* in Siberia by the distance from the Equator, the length of day makes wheat ripen there in as little time as in the Nile valley. A long day also implies a short night, *i.e.* a short opportunity for radiation; and, even if the sky were not cloudless—as it practically is in Siberia and Central Canada—the temperature of the land would still be wonderfully high in summer. Similar results are involved in the varying length of the seasons—from

the perpetual "summer" of the Equator to the perpetual "winter" of the Poles.

5. THE CHARACTER AND CONDITION OF THE SOIL.—All rocks "weather," and their surface is carried off by wind or water to form the soil of the earth. The agents at work in effecting this transformation are the expansion and contraction due to change of temperature, and the means of ingress given to frost and rain by the roots of plants ; and, when the soil is once spread over the underlying rocks, it becomes itself a climatic agent. For instance, as the Canadian prairie has been ploughed up, it has been found that the character of the soil and the kind of cultivation distinctly affect the rainfall. Sandy soil is quickly heated or cooled, while clay soils have the power of retaining heat owing to their moisture. Consequently, the sandy sheep-plains of Australia have intensely hot days and intensely cold nights, even at a comparatively short distance from the sea ; while the most central part of the Canadian clay wheat-lands have no *sudden* and *excessive* change.

Moreover, rain follows the plough. Ploughed land retains and eventually evaporates *twice* as much moisture as unploughed ; and, therefore, the cutting down of timber, *if* accompanied by thorough cultivation of the disforested area, is not likely to affect the rainfall very seriously.

N.B.—In this chapter and throughout the following pages, statements of scientific facts will frequently be found—partly from want of space—without any explanation. Where this causes any difficulty, the reader is strongly recommended to refer to any standard work on Physical Geography.

SOME ECONOMIC BEARINGS OF CLIMATE.

1. COLONIES—OF SETTLEMENT.—The consideration of climatic conditions has caused a classification of Colonies into those of Settlement and those of Exploitation. The tendency of climate, with its accompanying vegetation and conditions of human life, to vary less along Parallels than along Meridians, has caused the continuance of migration *westward* long after the decay of any superstitious belief in a Land of Eternal Sunshine far in the Golden West ; and, if the English colonisation of the United States seems to be a colonisation *southward* as well as westward, it must be remembered that the *mean temperature* of New York is the *same* as that of London, though the latter is the farther north by 10°.

The large population required for the development of Colonies of Settlement, and the similarity of the new to the old conditions of human life, make such colonisation possible only for an over-populated country, *e.g.* Great Britain ; but, even from an over-populated country, it would fail unless the country was rich enough to back up its enterprise.

2. COLONIES—OF TRADE.—Exploitation Colonies, on the contrary, require only the supervising element to be provided from the old country ; and, therefore, they are suitable for a country like France, which has no surplus population. The conditions of human life in the Tropics, however, by forbidding European labour, raise the question of "Where is the labour to come from?" If from native

racers, are they to work willingly—for wages, or on compulsion—as slaves?

3. **EFFECT OF GEOGRAPHICAL CONDITIONS ON CHARACTER—HOLLAND, EGYPT, AND BRAZIL.**—The question is immensely complicated by the effect of Geographical conditions on character. **HOLLAND** is a delta formed by the refuse of the Alps, and prematurely peopled; it is low, flat, damp, and dull. Its physical conditions have demanded thrift, foresight, and endurance from its inhabitants; and these qualities, aided by the experience of a life-long struggle with the sea, taught the Dutch how to fight and conquer the Spanish “Mistress of the Sea.”

EGYPT is also “the Gift of the River”; and its inhabitants, while enjoying natural boundaries of desert and sea, had no obstacles, in the shape of mountains or forests, to internal communication. The scenery is like that of Holland, flat and monotonous; and there was no timber for shipbuilding, the soil was very rich, and the climate was very hot. Here there was no struggle for existence; but the need for labour, owing to the density of the population and the dryness of the climate, saved its inhabitants from most of the evil effects of such physical conditions. Only they remained stationary.

BRAZIL, again, is largely of alluvial formation; but the abundance of moisture produced a dense, dark, damp vegetation, under the shadow of which the natives were overwhelmed amongst bush and creeper. Stunted in physical, mental, and moral growth, they yet had such enormous natural supplies of food that there never was any need for labour any more than there was opportunity for inter-tribal union. Centuries of life under such conditions made the natives unable to labour or to combine.

4. **LABOUR QUESTION.**—Very different causes have produced very similar results in the natives of Australia and South Africa ; and, therefore, there is a "Labour Question" on the Sugar Plantations of Queensland and Natal. In QUEENSLAND, indeed, the question came to a head in 1890, when an Act of Parliament was passed prohibiting the importation of Kanakas from the Pacific Islands, because the trade had become so like a regular slave trade ; and the result of the Act, though it is now obsolete, has been practically to put an end to the cultivation and manufacture of sugar by large capitalists.

In NATAL coolies are imported to do the work, under contract for a certain number of years ; and, at the expiration of their contract, they frequently settle down in the colony as small shopkeepers. The real difficulty, therefore, in Natal is in connection with animal, not with human, labour ; for the climate of the coast is very fatal to horses and even to oxen.

In SOUTH AUSTRALIA the question takes a very different form. There the climate encourages disease and vermin in the wheat fields, and yet ripens the crop very rapidly. Consequently, not only is the yield *per* acre miserably small, but also hand labour is both too slow and too expensive for reaping.

5. **SAVING OF LABOUR BY WATER-POWER.**—The economic effect of heavy rainfall, *e.g.* on the western shores of New Zealand or Tasmania, is very marked. For instance, not only have the amount and the violence of the rainfall on the slopes of Mount Bischoff so entirely washed away extraneous matter as to enable the tin to be *quarried* ; but also, as rain falls practically every day, the water-power of a cataract 124 feet high can always be used to drive all the

machinery. The same conditions are reproduced in the gold area of the New Zealand Alps ; and, as the great force and amount of precipitation depend on the nearness of the mountains to the sea, it follows that there can be very little land at their foot which could be spoilt by the *débris* necessarily connected with hydraulic mining. Cf. p. 153.

In this connection NORWAY is worthy of special notice. Its mountain system runs along the very shore of the North Sea, and rises in height towards the south, *i.e.* the warmer latitudes, where evaporation is heaviest. The evaporation is accentuated by the warmth of the sea, which is traversed by a branch of the Gulf Stream ; and the height of the mountains is so great that precipitation is complete and sudden. Consequently, there is an enormous number of waterfalls in the country, some of them 2000 feet high, *e.g.* on the Sogne Fjord, and all of them very close to navigable water and of constant volume. The importance of this to a country which does not possess a single coalfield, is simply incalculable. It is already largely used for motive power in connection with the various *wood* industries ; and there seems to be no limit to its ultimate development for electrical purposes. The TRANSMISSION OF ELECTRICITY over long distances is already an accomplished fact. For instance, Frankfort has been lit from the Falls of the Neckar, a distance of 108 miles ; and the enormous power of Niagara is being used experimentally, with a view to *possibly* supplying *all* the manufactories of the United States. Its power is equal to at least *four* times the total steam and water power at present in use in the States.

6. ARTIFICIAL LIGHT.—“Climate” affects the hours as well as the incidence of labour. The fact that the Earth

is spherical causes Degrees of Longitude—as the direct distance due east and west between any two consecutive Meridians is called—to differ greatly in length. At the Equator they are nearly equal to a Degree of Latitude—as the direct distance due north and south between any two consecutive Parallels is called—*i.e.* about 69 miles; but, as they approach either Pole, they decrease. At Cape Town or Sydney (New South Wales) the distance is about 58 miles; at London, about 44; in the north of Labrador, about 34; and off the mouth of the Mackenzie, about 23. All Degrees of Latitude, on the other hand, are practically the same size; and all places on the same Parallel have the same length of day at the same time. This may help to explain why *all* the old civilisations sprang up in *low* Latitudes, where the *shortest* day is at least ten hours long.

The variation of THE SEASONS is a precisely similar phenomenon. The earth, in revolving round the sun, always maintains a *fixed* position *pointing north* at an angle of $23\frac{1}{2}^{\circ}$ out of the perpendicular. It is this fact that causes it to present *four* sides to the sun in the course of one complete revolution, and thus we have *four* seasons. Moreover, as its axis is not perpendicular, the sun can light *more than half* of one Polar hemisphere at one time. Consequently, in that hemisphere the days are at that time longer than the nights; and, while the daily duration of light and heat is extended, the shortness of the night minimises the time and the opportunity for radiation.

The EFFECT OF THIS UPON VEGETATION is extremely important. For instance, long and continuous sunlight has a marked effect on the *quality* of grain; and, therefore, magnificent wheat can be grown at 60° N. in North-West Canada, and barley can be ripened *inside the Arctic*

Circle in Norway. The advantage of these long days was not apparent until good artificial light was invented to compensate for the consequent long nights during the other half of the year; and, therefore, as pointed out above, early civilisation sprang up in latitudes where the shortest day is at least ten hours—*e.g.* in China, India, Egypt, and Central America.

In higher latitudes, *e.g.* in Central Canada, THE LENGTH OF DAY at the time of year when most work has to be done is of great value to labour; and the presence of snow largely compensates for the *shortness* of the winter day. As agricultural operations are, however, entirely suspended in the winter owing to the climatic conditions, the short days are quite long enough for such work as can be done, *e.g.* repairs to building and machinery, threshing, &c.

In densely populated CITIES, on the other hand, the height and mass of the buildings, the liability to fogs, and the smoke from ten thousand chimneys, involve a heavy expenditure in the matter of artificial light; and hitherto no real attempt has been made to systematically make use of water power, even from a short distance, in generating electric light. Something has been done in this direction in Germany and in America, as has been pointed out above; but it seems to have somewhat escaped notice that in winter, when the demand for light would be most constant, the water power is almost invariably greatest.

It may, with perfect justice, be said that the climate of the British Isles enables men to work in the open air for more hours a day throughout the whole year than in any other part of the world.

7. FLOODS, &c.—Irregular disturbances, such as floods and earthquakes, are, of course, most disastrous to com-

merce and to commercial confidence. In large rivers, such as the Nile, the Ganges, and the Mississippi, the floods take the form of a more or less regular and reliable rise and fall ; but in small rivers, such as the coast rivers in Eastern Australia, the time or amount of flooding cannot be calculated with any hope of accuracy. The presence of lakes is of great value in checking the disastrous rapidity of floods, because the water is spread out over such a large area. For instance, the lakes along the St John River in New Brunswick effectually prevent the annual floods from being sufficiently sudden and strong to be dangerous to life or property. This is true of almost all the rivers of Canada. The mean annual fluctuation of the level of Lake Superior is not *two feet* ; that of the Missouri over the last hundred miles of its course is *fifteen yards*.

The effect of climate on EARTHQUAKES is less understood, but very important. Certainly, no region is exempt from the change of subterranean pressure caused by the "erosion" of one area and the deposit on another ; but the erosion is greatest on mountains, and the deposit is greatest on the floor of the ocean in the neighbourhood of a coast. From this it may be inferred that a low level in the interior of a continental region will be most free from the actual destructive force of earthquakes, and from the timidity and superstition among its inhabitants which are caused by vast, formidable, and unreliable phenomena.

THE ATMOSPHERE.

1. THE ATMOSPHERE is the outer gaseous covering of the Earth. It is a mixture of several compounds, the most important of which are Nitrogen, Oxygen, Water-vapour, and Carbonic Acid. The Oxygen is the element useful to animal life, and the Nitrogen simply dilutes it; the Vapour is the result of evaporation, and, therefore, can exist in large quantities only in *warm* air; the Carbonic Acid is the product of *used* animal and vegetable matter, and supplies living plants with much of the Carbon of which they are so largely composed.

2. VARIATION WITH ALTITUDE.—The atmosphere is calculated to be 100 miles high, but the pressure of its own weight compresses fully one-half of its whole mass within $3\frac{1}{2}$ miles of the sea level. Consequently, the density of the atmosphere on high mountains is not great enough for lungs accustomed to the greater density of lower levels; and travellers often suffer terribly from the difficulty of breathing on the Andes or Himalayas. On the other hand, the difference of temperature caused by the height enables Europeans to work in Latitudes where otherwise they could not, *e.g.* in the Queensland tin-mines at Herberton. The average height of clouds (*i.e.* condensed, suspended vapour) in the British Isles is about half a mile. Cf. p. 18.

3. WINDS.—Anything which changes the density of the atmosphere, and thus makes the pressure in one place greater than in another, causes a movement of the atmo-

sphere from the area of higher pressure to that of lower. Such a movement is called a wind ; and the chief agents in producing it are heat and vapour. The sun is the sole natural source of heat, imparting it directly to the atmosphere and indirectly to the Earth *through* the atmosphere ; the vapour is the sole natural source of fresh water ; and the winds distribute the moisture and equalise the temperature. In this they are aided by the oceans, which—unlike the land—are *not* stationary, but susceptible of being moved in currents.

4. VAPOUR.—As warm air can hold more vapour than cold air, the amount of vapour in the air increases with nearness to the Earth's surface and to the Equator ; and, as air ascends or moves polewards, the vapour is mechanically cooled into cloud. Moreover, as most of the vapour exists near the surface of the Earth, the clouds also are at no great height ; and this fact enables them to keep the Earth warm at night by absorbing and radiating back some of the heat given off by the Earth. If, however, the sky be clear, the temperature of the Earth's surface will fall until some of the vapour is condensed—*e.g.* into dew.

The EFFECT OF CONDENSATION is to resolve vapour into two elements—liquid which falls, and heat which rises. As warm air rises, cooler air gravitates in to take the vacant place ; and this cooler air must come from a region where the pressure of the atmosphere is greater, and where the heat is less. Near the Equator and the two Poles there are areas over which the surface pressure is permanently less than elsewhere ; and, therefore, there will be more or less persistent winds blowing into these areas.

5. TRADE WINDS.—All these persistent winds will start where the pressure is greatest, *i.e.* near the two Tropics ;

and it will be natural to expect that there will be winds blowing directly to the Equator and to the Poles from these two regions. This, however, is not the case, for the rotation of the Earth deflects the winds—to the right outside the Tropics, and to the left inside them. That is to say, they tend to always blow *from* or *to* the *West*, while the Earth is rotating toward the *East*. Thus there are constant N.E. and S.E. winds blowing to the *Thermal** Equator from—respectively—the North and the South Tropics, and constant S.W. and N.W. winds blowing from the same places towards—respectively—the North and the South Poles.

The constancy of these winds is so valuable to trade that they have been named the N.E. AND S.E. TRADE, and S.W. AND N.W. ANTI-TRADE, WINDS; and the constancy of the former is greater than that of the latter. As the Equatorial regions are always warmer than the Polar regions, there *must* be constant winds blowing to the Equator through the lower level of the atmosphere; and they are urged on by the higher pressure of the atmosphere near the Tropics. Of course, the winds that blow Polewards from the Tropics have no such exciting cause; for, while the low pressure at the Equator is due primarily to heat, that round the Poles is due primarily to the eddy in which the Poleward winds are whirled round by the deflecting power of the Earth's rotation.

6. ANTI-TRADES.—The regularity of the N.E. Trade Winds in the *North* Atlantic has been in the past, and is still to a considerable degree, of immense importance to the commerce of Great Britain, *from* which country they

* *N.B.*—Owing to the larger proportion of land *north* of the Equator, the line of greatest average heat is about 63° N. It is called the *Thermal* Equator.

are the carrying winds ; and this importance has been increased by the regularity of the N.W. Anti-trade Winds in the *South* Atlantic, which carry the commerce on *southward* from the Equator. The latter are much more regular than the S.W. Anti-trade Winds, *i.e.* those north of the Equator ; and the reasons are not far to seek. In the Southern Hemisphere the proportion of land to water is very much smaller than in the Northern, and therefore the winds meet with less resistance and more uniform temperature ; there are numerous volcanoes within the Antarctic Circle, the heat from which may be an exciting cause to the winds ; and the land round the South Pole is high enough to precipitate a very large amount of snow, hail, and rain from the damp winds off such an expanse of water, and condensation liberates heat. (*Cf.* § 4, above).

For these reasons the N.W. Anti-trade Winds are so exceptionally regular that they have acquired the title of "THE BRAVE WEST WINDS," and their effect on the Australasian trade can scarcely be over-estimated. At the same time, the Trade Winds are less regular south of the Equator than north of it ; and this for two reasons. The *nominal* Equator is several degrees farther south than the *thermal* Equator ; and the number of icebergs that are launched from the high coasts of the Antarctic continent exercise a cooling influence on the warmer water and atmosphere into which they gravitate.

7. MONSOONS.—Almost as important as these Trade and Anti-Trade Winds are the MONSOONS. A large surface of high land will, owing to the absence of vapour, be cooled or heated very rapidly ; and, when heated, it will act as an Equator, *i.e.* as a point towards which winds will be attracted by heat. The vast and elevated plateau of Central

Asia in this way is able not only to *reverse* the N.E. Trade Winds during the summer, but also to draw a portion of the S.E. Trades across the Equator into Asia. North of the Equator, of course, these winds are deflected to the right by the Earth's rotation, and become S.W. Monsoons, carrying an immense amount of moisture off the warm Indian Ocean, to be precipitated against the peaks of the Himalayan Range. During the winter, *i.e.* from October to April, the Tibet plateau is so cold that the N.E. Trades blow as over the other oceans.

8. CALMS AND CYCLONES.—In the belt of low atmospheric pressure near the Equator, where the air is rising, and in that of high pressure near the Tropics, where it is falling, the movement, being vertical, does not produce any perceptible effect, so that these areas are known as Belts of Calms. In the Equatorial Belt of Calms the three conditions necessary to the formation of Cyclones—moisture, heat, and calm air—are all present; and, as Cyclones travel westward and away from the Equator, the most dangerous storms occur in the western and tropical parts of the largest ocean, *i.e.* in the China Sea.

9. SEA AND LAND-BREEZES.—In addition to their usefulness for navigation, winds also carry moisture and warmth, or the reverse, to the countries to which they blow; and the distribution of these conditions decides the vegetable, and therefore to a great extent the animal, life in those countries. For instance, every maritime country experiences sea-breezes. As the sun approaches midday, the land becomes hotter than the sea, from which evaporation is taking place; and the rising of the warmed air over the land draws in a current of cooler air from the sea. This, of course, is an inestimable blessing in the noonday heat of a

tropical climate. At night the contrary process goes on, the radiation from the land making it colder than the sea, which the sun warms to a much greater depth than it can warm the land.

10. DESERT.—Farther from the sea the effect of the winds, though less regular, is almost more important. For instance, the line of desert which runs from the north-western corner of Africa across the Sahara, Arabia, and Persia, into Tibet, is due to the fact that no rain-bearing winds ever reach these areas. On the other hand, the eastern slopes of the Andes, which are *farther* from the sea than much of the Sahara is, receive sufficient moisture from the Trade Winds to give birth to rivers like the Amazon, Plate, and Orinoco.

11. SNOW-LINE.—Another illustration may be taken from the central part of the same range. In Bolivia, where the easterly winds are *driest*, the snow line is several hundred feet *higher* than on the Chili coast, because the Brave West Winds bring to the latter much more moisture than the easterly winds bring to the much greater elevation of Bolivia. The dry Föhn—*i.e.* the S.E. Sirocco—in a similar manner diminishes the amount of snow on the Alps, though there is still enough left to send cold winds—*e.g.* the Mistral—down into the surrounding countries.

12. "CONTINENTAL" CLIMATE.—Dry winds must have come over land, and therefore they tend to be very hot in summer and very cold in winter; but, in at least one instance, a dry wind is consistently warm. This is the Chinook wind, which blows through the deep depressions in the Rocky Mountains on to the Canadian prairies. Most of the moisture is taken out of it by the mountains; but,

thanks to the low level at which it travels, it is still warm from the Japan Current when it reaches the prairies.

It will be natural, then, to expect the greatest cold along with the least precipitation in the centre of a large, bare, flat continent, and the most even temperature along with the heaviest precipitation on forest-clad hills near warm seas. The total rainfall at Moscow is about *one* foot a year, *i.e.* nearly 800,000 tons to the square mile; that at Glasgow, which is in the same latitude, is about *four* feet. At Moscow there is skating for four *months* every year; at Glasgow to have it for four *days* consecutively is quite exceptional. The reason why dryness causes such intense cold is because radiation of heat from the earth is intensified by the absence of vapour. At Assouan, 700 miles *south* of Cairo, *ice* is found on the Nile when the season is unusually dry!

THE SEA.

1. ITS SIZE.—Five-eighths of the surface of the Earth is covered with sea to an average depth of $2\frac{1}{2}$ miles, and there is continuous communication over almost the entire area. Thus there is easy access to and from the great *inland* seas of the Atlantic basin and the great *border* seas of the Pacific basin.

2. TEMPERATURE AND DENSITY.—The temperature of the sea varies greatly, but gradually, according to depth ; and the density of it varies also, according to the amount of evaporation and precipitation. In the Trade Wind regions, and over inland seas like the Mediterranean, the evaporation is enormously in excess of the precipitation ; under the constant rainfall at the Equator, and among the melting ice of the Polar seas, the increase of fresh water decreases the density of the *surface*.

The surface waters at the Equator, however, owing to the increased heating power of the sun's vertical rays, are much warmer than those in the Polar seas. At the same time, the temperature at the bottom of the sea is about the same in both places.

3. WAVES AND TIDES.—There is another great difference between surface and deep water. Surface water is often agitated by wind into an undulating motion, which we call Waves, and which is very slightly progressive ; deep waters are subject to very important periodical motions, which we call Tides, and which travel at a rate of from 500

miles an hour downwards, according to the depth of the water.

In the open sea the rise and fall of Tides is probably less than 2 feet, but as the water is "narrowed and shallowed" by land formation, the rise and fall increase greatly. For instance, a tide of 30 feet is common in the Bristol Channel; one of 40 feet is common in the Bay of Fundy. These strong tidal currents are dangerous to shipping directly and indirectly—the latter by heaping up bars at the mouth of rivers; but where, as round the Bay of Fundy, they bring large deposits of fertile mud, they are very valuable to agriculture. With a favourable wind a spring-tide is said to have risen from 70 to 90 feet in the Bay of Fundy.

4. THE TIDE IN THE THAMES is worthy of special attention. The tidal wave which strikes the coast of France near Brest, is broken into two parts, one of which is diverted up the west coast of Ireland, while the other advances up the English Channel. Eventually a "Channel" and an "Irish" tide arrive in the German Ocean, where their meeting has probably caused the Dogger Bank; and the "Channel" tide enters the Thames at the same time as the "Irish" tide, though the latter is really twelve hours *behind* the former, having had to travel round Scotland. This gives the Thames a double tide; and, as the Thames is very much more free from ice than the Elbe, it thus has two distinct advantages over the German river. This fact becomes more important when it is remembered that, as the only open sea coast of Germany is round the mouth of the Elbe, German goods *must* seek markets by the same route and in the same direction as London goods.

6. CURRENTS.—In addition to waves and tides, the sea

is subject to currents, which are due to several causes. The principal cause is the unequal density of different parts of the sea, arising from differences of temperature and of saltness. The expansion of heat causes surface water to gravitate towards the Poles, and the pressure of this over the deep Polar water causes the latter to move towards the Equator. The vapour taken by the Trade Winds from the Tropical surface water is precipitated when these winds begin to rise under the heat of the Equator; and thus the Equatorial water is made fresher, and therefore lighter, at the same time that it is being expanded by heat. This increases the Equatorial gravitation Polewards.

The precise DIRECTION OF THESE CURRENTS is, however, greatly modified by the rotation of the Earth, the configuration of land both above and below the sea level, the counterforce of other currents, and the power and direction of the prevailing winds. Consequently, the general tendency of the surface water is (1) *Westward*, on either side of the Equatorial calms; (2) *Northward* or *Southward*, from the end of the westward course; (3) *Circular*, returning with the Trade Winds to the Equator.

The current in the North Atlantic is called the GULF STREAM, because the Equatorial overflow escapes by the broad and deep Yucatan channel into the Gulf of Mexico; and the configuration of Florida makes it unusually rapid, its pace being calculated to be from 70 to 100 miles a day. The similar stream in the North Pacific is called the KURO SIWO, or Black, or Japan Stream; and its regularity is disturbed by the number of islands off the east coast of Asia and by the strength of the N.E. 'Trades.' Behring Strait, however, is much shallower and narrower than the openings from the Atlantic into the Arctic Ocean, and

therefore the drift of icebergs southwards is considerably less in the North Pacific than in the North Atlantic. Thus on the *east* shore of the Pacific the Japan Stream is practically as warm as the Gulf Stream is on the *east* shore of the Atlantic.

The current in the South Atlantic is called the Brazil, that in the South Pacific the East Australian, and that in the Indian Ocean the Mozambique.

The chief cold current from the Arctic Ocean is the LABRADOR, on which ice drifts to the latitude of New York ; but from the Antarctic Ocean there are three important currents, the West Australian, the Benguela, and the Peru or Humboldt's Current.

All these CURRENTS MODERATE THE TEMPERATURE into which they flow, either by raising or by lowering it ; and, where a warm and a cold current meet, besides causing considerable danger to navigation in the way of fogs, the consequent melting of icebergs deposits a large quantity of rocky material brought from the shore against which they were formed. It is such a deposit, for instance, that has formed the Newfoundland Banks ; and not only do cold currents produce the best fish, but also they bring down millions of minute organisms which supply the fish with food most abundantly.

MOUNTAINS AND RIVERS.

1. THE AVERAGE ELEVATION OF THE EARTH'S LAND SURFACE is about 2000 feet, which is a quite insignificant amount in comparison with the size of the planet ; but some areas reach a height very much greater than that. The average elevation of Asia is nearly 3000 feet ; and its highest peak, Mount Everest, is 29,000 feet. Europe has an average of under 1000 feet, though the peak of Elbrooz reaches about 18,500. Africa and North America have an average of about 2000 feet ; and their highest peaks, Kilimanjaro and Mount Wrangell, are respectively rather below and rather above 20,000 feet. Sorata in South America reaches a height of 24,000 feet. Australia has *no* mountains of any really serviceable height !

2. THE USES OF MOUNTAINS.—Mountains have many uses. They affect climate by keeping off winds and attracting rain ; they form a natural boundary to countries ; they are the sources of soil for the plains which stretch from their base ; though not admitting of agriculture, they often afford valuable pasture ; they do admit of useful irrigation tillage in terraces ; and the contortions of their strata expose mineral wealth. *Cf.* p. 69.

Mountains have usually A DRY AND A WET SIDE. Vapour-bearing winds are compelled to ascend in trying to cross a mountain range, and the consequent loss of heat causes precipitation on the windward side. This is sometimes sufficient, *e.g.* in the United States and New Zealand, to

cause a dense forest growth, while on the lee side the moisture is only just sufficient for grass. As the wind sinks on this lee side, it is warmed ; and the consequent decrease in its relative humidity causes the cloudless sky, dry climate, and great range of temperature, such as are found to the east of the Rocky Mountains.

The moisture thus brought to them, they store in pools, lakes, glaciers, and perpetual snow, from which flow perennial RIVERS ; and these rivers carry with them from their mountain cradle immense quantities of soil. It has been calculated that probably *five miles'* depth of soil has thus been removed from the Appalachian Mountains, and certainly every detail of shape is due to erosion ; but this calculation is more or less a guess, and in any case erosion is not uniform even over the same range.

The MILITARY value of mountains may be illustrated by the fact that the ranges in which the Cymry found refuge from the Saxon invaders are still called Cambrian and Cumbrian ; but, of course, in proportion as mountains offer any real protection, so they offer also serious obstacles to commerce and communication, especially in the absence of railways. An interesting comparison may be made between Russia and Switzerland. With an enormous difference of size, both have special water facilities, Russia for communication and Switzerland for mechanical power ; and both have been hampered—the one by the enclosing ring of mountains from which it gets its water-power ; and the other by the absence of such physical protection—which makes its canal and river system so useful.

The "WEATHERING" of mountains sometimes supplies a special quality of soil which renders possible the cultivation of a particular plant in an otherwise unlikely place. For

instance, the province of New Brunswick is practically unsuited for the production of wheat; but an exception to this is found in the north-west. There the hills which separate New Brunswick from Quebec are composed of slatey clay and limestone; and the weathering of these, fertilised for centuries by the fall of forest leaves, makes an admirable soil for wheat. Somewhat similar conditions have made the Niagara peninsula very famous for its fruit-trees.

The exposure of MINERAL wealth on the sides of hills and mountains and in river valleys, has led to almost all the great mining enterprises in the world. Naturally, such exposure comes first on the windward side of high ranges near the sea. Thus, *copper* was discovered on the west side of the Chilian Andes, *tin* on the west side of the Rumbö Mountains, *gold* on the west side of the New Zealand Alps, and *coal* on the west side of the Pennine Range. A similar result often arises from a sudden change of level in the interior of a continent. Thus, *coal* and *iron* have been laid bare between Moscow and Tula, *copper* and *nickel* between Sudbury and Algoma. The first coal that was mined, or rather *quarried*, in Scotland was discovered by the Newbattle monks in the Esk valley.

3. THE SHAPE OF MOUNTAINS is very largely determined by the material of which they are made, and of which the soil at their base will subsequently be made. For instance, while chalk appears in downs or limestone in tors, granite weathers into bald, jagged peaks, alternating with deep depressions; and, where the depressions in one range are shut off from the sea by a parallel range, rivers which start on the wet side of the inner range may flow *inland* through the depressions. This is the case, *e.g.* with the

Peace, Liard, and Athabasca rivers, all of which rise *west* of the Rocky Mountains proper.

In other words, while STRATIFIED rocks, such as sandstone and shale, weather regularly, because water can find definite channels along the strata, granite and other UNSTRATIFIED rocks weather irregularly. VOLCANIC CONES, however, are an exception to the general shape of the latter class of rock ; and, as their shape does not admit of glacier formation on their sides, they are of very little use as river feeders during a tropical summer. For instance, the volcanic peaks of the North Island, New Zealand, are of no use in this direction compared with the much lower stratified mountains of the South Island.

4. PERMEABILITY OF ROCKS.—All rocks *can* absorb water, but the power of absorbing it varies very greatly. For instance, compact rocks absorb it very slowly, and then do not allow it to escape ; loose rocks absorb it readily, and pass it on readily. When the rocks are permeable, the water sinks through them until it reaches an impermeable stratum ; and, when permeable strata occur *between* two layers of impermeable strata, there is at once a hope of obtaining water from a natural subterranean reservoir. Such water is obtained by Artesian boring ; and the future of Australia practically depends on a wide use of this over the limestone formation. The permeability of such formations not only enables water to be stored in this manner, but also prevents the terrible floods which would otherwise follow heavy rain *everywhere*.

5. RIVERS.—Absorbed rainfall also reappears in the shape of rivers, which in turn lose by evaporation a very considerable portion of their volume, to be again precipitated. The amount evaporated, of course, varies with the

climate of the particular region: from the Nile it is very great, from the Thames very little. As the amount of evaporation varies, so also does the volume of running water in the river. The Nile does not discharge as much water as the Ohio, which is only *one-third* of its length; the Mississippi is the longest river in the world, yet both the Amazon and the Congo discharge *two* or *three* times as much water every year. Variations in volume are naturally due to the variable supply of precipitation, and, therefore, the larger the basin of the river, *i.e.* the larger the area from which the supply is collected, the greater is the regularity of the variation.

6. THEIR USES.—Rivers water and drain the countries through which they flow; and, where their descent is not too rapid nor their depth too little, they act as great highways of commerce. In this case they become also civilising agents, for the days are past when dwellers by the same river could be called *rivals*. So, too, are the days when rivers could be looked upon as real physical boundaries. They are still very convenient political boundaries, *e.g.* the Limpopo, between parts of British South Africa and the Transvaal, or the St Lawrence, between parts of Canada and the United States; but they now join, rather than separate, the people on their opposite banks.

Rivers are the chief agents in the REMOVAL OF "WEATHERED" ROCK, either in solution or in suspension, and the amount removed varies greatly with the pace of the current, a *doubling* of the pace increasing the carrying capacity *sixty-four* times. Thus rivers like the Rhone, the pace of which makes them useless for navigation, not only supply great motive power, but also deposit an amount of alluvium most valuable to agriculture. For instance, the

Rhone discharges into the Gulf of Lions yearly enough solid matter to make a pyramid with a base of 1 square mile and a height of quite 200 feet. When the rainfall over the basin of such a river is light, as in the Nile valley, the weathering of the sides of the valley is so slow that the river ploughs itself a deep but narrow bed; and if—in addition to light rainfall—the pace of the river is great, the depth and the narrowness will be excessive, as in the cañons of the Rocky Mountains.

Under such circumstances it is obvious that the value of the river for both irrigation and sedimentation is very greatly impaired. For instance, the Clutha is said to discharge as much water annually as the Nile, and its lower course traverses a *coal-field*; but there is not a town of any kind at its mouth, or of any size throughout the whole of its lower course! Moreover, the wearing power of a fast river heavily charged with sediment makes its bed very liable to alteration, as is the case with the Clutha and all the other New Zealand rivers.

THE IDEAL RIVER is one like the Rhine or the Nile. The RHINE, “filtered” by passing through Lake Constance, plunges over the Shaffhausen Fall, like the St Lawrence over Niagara, pure enough to have little corrosive power (though the violence of the Niagara current *undermines* the soft shale *below* the fall); the barriers of the Vosges and the Black Forest, only 20 miles apart, have caused the deposit of a large and deep alluvial plain along the Upper Rhine; and the narrow gorge north of Mainz compresses the Middle Rhine into a grinding mill to supply the soil of which Holland is composed.

The NILE flows for 700 miles through Upper or Southern Egypt, the breadth of which is nowhere more

than 10 miles ; it is seldom less than 1 mile broad itself ; it passes through no lakes, but does tumble over formidable cataracts ; it, therefore, filled its upper valley with deep alluvium, and, when it was freed from restraint, *i.e.* below the First Cataract, spread out its slower waters to deposit the Delta. The current is *always* strong enough to carry a vessel *down-stream* ; and during the summer, *i.e.* from April to October, the Etesian Gales blow *up-stream*.

In some cases we find a sort of compromise, *e.g.* on the SASKATCHEWAN. As that river rises in the Rocky Mountains, the melted snows flood it in summer with water heavily charged with alluvium ; and the current *down-stream* absolutely prohibits any navigation *up-stream*. The natural resources of its basin are grain, chiefly wheat. Grain is light in bulk, but *cannot bear costly transport* ; it is, therefore, as on the Danube, carried *down-stream* in flat-bottomed boats quickly and economically. The demand on the wheat-farms is for machinery and manufactured goods, both of which *can* bear the much more costly transport *up-country* by *rail*.

The expansion of rivers over LAKE SURFACES not only causes partial or complete sedimentation, but also greatly increases evaporation off the given volume of water ; and, if the expansion is extended until the evaporation exceeds the inflow, the water of the lake will gradually become salt, as in the countless Salt Lakes of Australia.

TRANSPORT.

Division of labour, facility of despatch, and mutual convenience generally cause the concentration of individuals in towns, mainly commercial or manufacturing. In a country like Great Britain, which cannot supply most of its demands from its own home resources, almost all the large commercial towns are ports ; and, of course, the whole existence of a port depends upon its waterway. London is by far the most important commercial centre in Great Britain, although coal and iron lie much farther from it than from Glasgow, Barrow, Newcastle, or Liverpool.

1. **ROADS.**—These commercial centres draw their supplies for export from manufacturing and mining towns of less individual importance ; and in all civilised countries properly-bridged roads on a reasonable gradient connect all the towns. These roads are, however, of infinitely less importance than they were in the old coaching days before the invention of railways ; but in new countries, like Australia, Stock Roads are of great use. They are strips of land about a mile wide, fenced with wire on both sides and provided with water.

MOTIVE POWER on all roads is procured almost entirely from animals. In places where insects or climate make it impossible for beasts to live, *e.g.* in the tsetse region of Africa, human porters are employed ; where endurance and sure-footedness are required in a climate that is at least fairly warm and dry, *e.g.* Southern Europe, donkeys and mules are the cheapest and the most useful ; in desert and

semi-desert regions, *e.g.* Central Australia, the camel is indispensable ; only yak and sheep can carry loads up and down the rocky paths of the Himalayas ; the llama does a similar work in the mining districts of the Andes ; and the elephant alone can be of any service in marshy Tropical vegetation.

Animals can pull more than they can carry ; and, where the climate is either very dry or very cold, vehicles can be used even in the absence of roads. Thus dogs and deer draw sledges over the barren snow-fields of Greenland or the mossy Tundras of Russia ; and bullock-waggons cross the hard plains of South Africa and America. In Great Britain over the excellent macadamised roads almost all traction has hitherto been done by horses. An average load is—in a two-wheeled cart, 1 ton,—in a four-wheeled cart, 2 tons, *i.e.*, about twenty-five times as much as a horse can carry on its back as a regular load.

In countries like Holland or India great difficulty has been experienced in procuring METAL FOR THE ROADS, and many of the Dutch roads are paved with brick. In India, too, the huge rivers offer a very formidable obstacle to successful road communication. In alluvial countries, however, the dead level, and—usually—the presence of navigable water, compensate for the absence of stone ; and the possibility of dangerous and destructive floods generally implies the existence of navigable water. But among the massive parallel ranges of the Andes, where, of course, there is abundance of stone, Tropical rains are intensely destructive to imperfectly made roads, and yet there is no compensation in the shape of navigable water. The effect of this on trade may be illustrated from the two republics of Colombia and Ecuador.

COLOMBIA is naturally endowed with a wonderfully rich soil, great mineral wealth, dense forests, and a river (the Magdalena), which is navigable by boats for 450 miles from the sea (to Honda); and the country has enjoyed long tranquillity. Yet for about eight months in the year there can be practically *no trade*, because the so-called roads are made impassable by rain. Even the capital, Bogota, is almost inaccessible at times, although the distance to Honda from the plateau on which it stands is *only 42 miles*. The mail, which is carried on mules, is *three days* in doing that distance; and goods are sometimes *three weeks* on the way. This delay, and the rough usage of the goods during the bad weather, cause great loss and annoyance to the local merchants.

The position of ECUADOR IS EVEN WORSE! The natural result is a continual decline in trade, which is accounted for by the Director of Commercial Statistics at Guayaquil in a dozen different excuses:—A bad cocoa harvest, the low price of ivory nuts in Europe, political revolutions, the transfer of capital abroad, the exclusion of Bolivian and Colombian coin from circulation in the country, the denunciation of the commercial treaty with Colombia, the imperfections of the customs tariff, the absorption of local capital by the large and constant loans to the Government, the recent financial crisis in Europe!

To this we may add a few neglected items. The means of INTERNAL COMMUNICATION are in such an extraordinary condition that people in different parts of the country are absolutely strangers to one another—so much so that the notes issued by the banks in the capital, Quito, are *not current* in the chief port, Guayaquil. The so-called roads are generally mule-tracks, which are practically closed

throughout the rainy season, *i.e.* for half the year; and, where there is no ready-made mule track, recourse is had to the bed of a torrent which has ploughed a fairly distinct channel through the loose volcanic soil. Even over the main track from Quito to Guayaquil merchandise cannot pass at all during the winter; and a mounted postman has actually been drowned in the mud in attempting to carry letters between the two cities. Even in the open season goods sometimes take *six months* to travel over the 200 miles of land between Bodegas and Quito.

It is worthy of notice that the NATIONAL CHARACTER is responsible for this absurd condition of affairs; splendid causeways were originally built and maintained by the Incas, but their conquerors have squandered on convents and churches twice as much money as would have kept the old works in decent repair. Other instances of incredible folly are not wanting. Agriculture means scratching the surface of the soil with a wooden plough; ripe wheat is cut with a knife; while every grain of maize is picked separately out of the ear; winnowing is done by hand; and the first man who dared to import a cart to facilitate harvesting was promptly fined!

2. RAILWAYS are the quickest and surest medium of communication. Their cost depends largely on the price of land and on the difficulty of making the permanent way and of procuring materials; the gradient decides the gauge, and the gauge decides the amount of materials needed. A steep gradient requires a narrow gauge, and that prohibits speed; but hill products are usually minerals, which have great weight in small bulk, and for which speed is not needed. Plain products are usually vegetable, and have small weight in great bulk;

and the population of plains demands speed, which is impossible without a fairly broad gauge.

In thinly peopled NEWLY SETTLED COUNTRIES railways are very valuable in developing natural resources ; and, therefore, special efforts are necessary, *e.g.* in the British Colonies, to provide railway accommodation. Reference will be made below to the great Canadian system ; in NEW ZEALAND an equally good system is in use, though it has no Imperial value, and its effect has been very marked. The Maoris and the contour of the country tended to produce isolation of the various settlements ; but the railway commerce has broken down all such isolation, and has proved a real federal bond. Indeed, the railway accommodation, *e.g.* at docks, is so far ahead of actual wants that it involves the Colony at present in some temporary loss and debt.

The only drawback to the New Zealand railway system is that its different lengths are not all in connection with one another ; and the same is true of the AUSTRALIAN SYSTEM. While, however, in New Zealand there is in places a double gauge to accommodate different kinds of traffic and connect different kinds of country, in Australia each Colony has only *one* gauge, and every Colony has a *different* one. This, of course, absolutely prohibits any through traffic ; and the first change that the Commonwealth of Australia should make, should be one to a uniform railway gauge, as was done in the United States in 1886.

The effect of this on even comparatively unimportant industries may be illustrated by the VICTORIAN FISH TRADE. There are about 10,000 Chinamen on the Queensland gold fields ; and with a Chinaman fish is an "acquired" necessity, like tobacco to the British workman, or tea to

his wife. Of course, apart from any Chinaman, the commercial products of the sea are of immense importance, partly because the sea is infinitely more productive than the land, and partly because marine industries have a very significant relation to commerce and defence as well as to food and agricultural science. The average crop of wheat *per acre* throughout the world is roughly *half-a-ton*, and there is practically no place in which more than one crop can be gathered *in each year*; but *three tons* of fish can be caught by one boat in *one night* over quite a few acres of sea, and there is three times as much sea as land in the world. (1 lb. of bread may = $2\frac{1}{2}$ lbs. of fish.)

Now the general idea that the AUSTRALASIAN WATERS are very badly supplied with fish is quite erroneous. Apart altogether from the shark fishery of New Zealand, which is in a most prosperous condition, there are various flourishing fisheries connected with, *e.g.* the Victorian ports of Frankston and Hastings; but reasonable precautions must be taken with regard to season and situation, the colder waters producing the finer fish. This implies that the Victorian fisheries might be very largely developed; but, of course, such development would be practically impossible without a uniform Inter-Colonial gauge to prevent the delay and expense connected with transference of goods.

Railways are naturally more important in continental than in maritime countries; but everywhere their influence has done more than anything else to promote the wonderful commercial development of the last half century. Towns like Crewe or Swindon, and cities like Chicago or Winnipeg, owe their very *existence* to railway influence; and many cities in Europe owe their importance to the same cause. For instance, it is well worth while noticing where

the lines from Calais to Marseilles, from Rotterdam or Hamburg to Genoa, from Stettin to Trieste, from Libau to Sebastopol, or from Riga to Tsaritsin, cross the great lines from Paris to Bucharest, Constantinople, and Salonica, from Paris to Moscow, from Hamburg to Odessa, from Lisbon to Brindisi, or from Cadiz to St Petersburg. Attention will thus be drawn to the enormous importance of, *e.g.* Switzerland as a transit centre.

Special railways are in use for special purposes. For instance, toothed-rail or rope railways climb the Rigi and other Swiss mountains; there are overhead railways in Liverpool and New York, and underground railways in London and Glasgow; and a ship railway conveys vessels from the Bay of Fundy to the Gulf of St Lawrence. *Cf.* p. 50.

In view of the very emphatic statements that have been made to the House of Commons both by Members and by witnesses (speaking in the interest of individual traders), it may be useful to emphasise the fact that a Railway Company in Great Britain is simply a trader on a very large scale. What it has to sell is transport service; and its object is to conduct its service so as to attract the largest possible amount of business. Consequently, if any particular company in the country is flourishing in spite of competition by rail, road, sea, and river, there is only one legitimate inference, namely, that it is giving the public a fair article at a reasonable price. At the same time, it is obvious that the company can afford to give the best terms to its largest and most regular customers; and, therefore, the so-called "undue preference for foreigners" is simply an ultra-patriotic interpretation of a perfectly just and logical economic law.

It would seem to be obvious also that, as all men are consumers, competition must be advantageous to the public, however disadvantageous it may be to individual traders ; and it is certainly a fact, whether obvious or not, that *fish* from Wick cannot compete in London with fish from Great Grimsby, or *beef* from Wyoming with beef from Westmoreland, unless a *lower* rate *per* mile is charged over the *longer* distance. In a word, it is entirely to the advantage of the consumer that railways should neutralise natural geographical advantages ; and this truth implies also that the charge made for the carriage of any particular commodity should be proportioned to the relative value of the service to the public rather than to the relative cost of the service to the company. That is to say, *silk* must pay more than *bread*, however much the Macclesfield manufacturers may complain.

Further, three things may be noticed in this connection. One is that the cost of the carriage of goods in this country is a comparatively unimportant item in their total cost, owing to the shortness of the distances ; and this cost would be still smaller if the *local* traffic were in *wholesale*, as in the United States, instead of in *retail* quantities. This, however, is quite impossible for "way-side" stations, unless we introduce the despotic measures in vogue in the States ; and, on the other hand, between all the large commercial centres in the country there is such fierce competition for carriage that rates *cannot* be high. The second point is that English railway rates *include* the collection and the delivery of the goods, which are practically never included in Continental rates ; and they are usually paid for goods carried at the risk of the company and at a *very much quicker* pace than is ever thought of on the Continent.

Thirdly, although water carriage is naturally much cheaper than land carriage, the excellent canal system of this country is comparatively unused ; at all events, it cannot compete with the railway system when the rate is compared with the *efficiency of the service*. Otherwise, the canals would be more used than they are at present. Cf. p. 71.

It is, therefore, obvious that, however much "undue preference for foreigners" there may be, the rates charged to natives (1) cannot, with much semblance of justice, be called extortionate, and (2) are distinctly to the advantage of the *consumer*. On the other hand, it is distinctly to the disadvantage of the consumer that railway companies should be compelled to pay such extortionate prices for their land in the first instance, and then to pay such heavy taxes on that land. For these expenses subsequently re-appear as interest on capital—the English companies pay an average of about $4\frac{1}{2}$ per cent.—and have to be defrayed by "cost of carriage." The latter has also to defray movement expenses, station expenses, and maintenance of way ; and on each of these points the British public is much more exacting than the American or the Continental. It refuses to wait itself, or to arrange its business so that it can travel at times convenient to the company, or to wait for its goods : it is impossible to imagine an Aberdeen merchant waiting, as he would be *compelled* to wait in France or Germany, *a week* for goods from London. It refuses to be content with trestle bridges, wooden platforms, and rails laid directly on to the bare rock. It demands signalmen at specified distances and separate rails for special traffic.

Under such circumstances, it would not be surprising if English rates were high, and that, too, without being in the

least extortionate; and some of them are unjustifiably high, especially those for local traffic in small quantities. On the other hand, some of them are actually very low, especially those for food in wholesale quantities; but in many of these cases middlemen rob both the producer and the consumer of all the advantage which ought to accrue to both from the low rate. For instance, it has been publicly asserted, on behalf of the Montrose fishermen, that, out of the total cost of their *cod* to the consumer in London, not 7 *per cent.* goes into the pockets of the men who own and man the boats; and it is acknowledged that the railway rate to London averages about 7 *per cent.* Where the other 86 *per cent.* goes is "not found." In such cases it is morally certain that any decrease of the rate would only go to increase the enormous profits already made by the middlemen.

3. WATER CARRIAGE, by river, canal, or sea, is cheaper than land carriage, because the water itself bears the weight, and only motive power is needed. For instance, the same horse that could only draw *one* ton in a two-wheeled cart can draw *forty* tons in a barge! Consequently, goods that are very heavy or of little value, *must* be carried by water; and this fact will for a long time impede the development of, *e.g.* copper mining in Australia, or iron mining in South Africa.

The comparative cost of some different kinds of carriage may be estimated from a transaction which took place in 1892. A London merchant bought 200 tons of second-class flour in Liverpool. Sending it to London by rail was out of the question, although the London and North-Western Railway rates for *through* carriage between the two places are so small as to do little more than pay the cost

of movement ; and the local sea rate was such a trifle less than the land rate that it paid the buyer to ship the flour from Liverpool to New York, and then back from New York direct to London at *through long-distance rates* ! Cf. p. 72.

The wonderful CHEAPENING OF SEA CARRIAGE has been due partly to more scientific knowledge of the regular currents of wind and water, and partly to inventions for saving fuel or diminishing resistance. For instance, Atlantic liners are now all built "sharp," and very few are square-rigged ; and triple-expansion engines can now drive *ten* tons of cargo across the Atlantic with about the same expenditure of coal which used to drive only *half* a ton ! Moreover, this saving of fuel has been accompanied by a positive *increase* of speed ; and the combination of increased speed with decreased cost enables many commodities to be now conveyed great distances by sea. For instance, butter can be brought fresh from Halifax, Nova Scotia, to Glasgow, at a cost of one farthing per pound !

The use of CURRENTS OF WIND AND WATER is, of course, much more important to sailing ships than to steamers. For instance, a clipper leaving a British port for Australasia at first hugs the European coast, in order to get the full advantage of the N.E. Trades ; but south of the Equator she hugs the American coast, in order to avoid the S.E. Trades, and holds on southward till she reaches the latitude of "the Roaring *Forties*." Then before "the Brave West Winds" she holds due east past the Cape of Good Hope. On the return journey, all this is reversed. Holding still *eastward*, she makes Cape Horn, and keeps on her course till she is near enough to the African coast to get the full advantage of the S.E. Trades ; but north of the Equator she hugs the American coast, in

order to avoid the N.E. Trades and to take full advantage of the S.W. Anti-trades.

It is partly the desire to be independent of all currents that is causing wooden clippers to be universally discarded in favour of IRON AND STEEL STEAMERS. This tendency is now so strong that some places once famous for their wooden clippers have now entirely lost their ship-building trade. This has been the case with all the eastern provinces of Canada except Nova Scotia, which is the only one possessing large deposits of good coal and iron in close proximity to one another. Even steamers, however, are affected by currents and winds, especially by regular winds such as the N.E. Trades in the North Atlantic, or the "Brave West Winds" of the "Roaring Forties" in the South Atlantic and South Pacific. It is due to the latter, for instance, that the outward route to New Zealand, even for steamers, is round the Cape of Good Hope, while the homeward route is round Cape Horn. In this particular case the outward voyage is further facilitated by the regularity of the N.W. Anti-Trades in the South Atlantic, which is itself due probably to the existence of active volcanoes on high land within the Antarctic Circle; and certainly the regularity of the passages made by, *e.g.* the steamers of the New Zealand Shipping Company, is very remarkable. The *Aorangi* has made three successive voyages in just under 39 days 7 hours; and four steamers which left Plymouth in four successive months during the Antipodean spring and early summer—August to November—averaged 39 days 5 hours.

The change from clippers to steamers is, however, partly due to the character of the commodities carried. For instance, tea is very sensitive to a long sea-voyage; and

fruit, butter, and live cattle—the trades in which are all of recent growth—must have quick transit. Of course, the question of competition has also to be considered ; and it is further complicated by the fact that different parts of the world have their harvests at different times. For instance, the summer is earlier in Cape Colony than in any other British possession south of the Equator ; and, if Cape fruit can arrive in England in January, it practically has the market to itself. Now, the soil and the climate of the Cape are wonderfully well suited to the vine ; the direct steamers, *e.g.* those of the *Castle* line, make no stoppage except for a few hours at Madeira ; Cape Town is almost in a straight line with London ; Lisbon, the port for cork dust in which to pack the fruit, is *en route* ; and almost all steamers trading southward past Lisbon call at Cape Town for coal before entering the latitude of the “Roaring Forties.” The Cape is, therefore, the natural source to which British merchants should look for a regular supply of fresh grapes during mid-winter in Great Britain.

SHORTENING OF ACTUAL DISTANCE is, of course, the same thing as shortening the time ; and the desire to combine the two with the cheapest possible mode of carrying, *i.e.* by water, has led to an immense development in the construction of canals and the canalisation of rivers. Moreover, the further desire to economise fuel and to make it go as far as possible has led to a great increase in the size of ocean vessels. To accommodate these monsters very extensive harbour works have had to be constructed ; and where this has been neglected, a number of old *river*-ports have been supplanted by new *sea*-ports lower down on the same river. For instance, while the Shipping Returns for Bordeaux showed a distinct *decrease* in 1892 compared with

1891, in regard both to the number of vessels and to their tonnage, similar returns for the lower port of Pauillac showed a distinct *increase* in both respects. In the same way St Nazaire is supplanting the old river port of Nantes, and Cuxhaven is supplanting Hamburg, for which, indeed, it has always been the winter port.

This principle holds good with regard to ports which are near one another, but not on the same river. For instance, SURAT was once much more important than BOMBAY as a harbour, just because it stands fourteen miles up a river, and the light vessels of those days could thus load or unload farther from the sea. Now that the enormous increase in the amount of trade has necessitated an increase in the size of vessels, and that the unique advantages of the Bombay harbour to Indian shipping have necessitated the building of railways across the Western Ghats to provide Bombay with inland communication, the river port of Surat has sunk into absolute insignificance beside the ocean port of Bombay.

The development of Bombay is very largely due to the opening of the SUEZ CANAL, which revolutionised the Eastern carrying trade. Indeed, the success of the Canal may perhaps be gauged best from the number of its imitators. Unfortunately, the Panama Canal, which was intended to do for Westward trade what the Suez Canal has done for Eastward trade, has been left half-finished; but the Nicaragua Canal seems likely to be a success, though its destined length—170 miles—is nearly four times that of the Panama Canal. Of this total length, however, a very small fraction needed excavation. Lake Nicaragua alone gives $56\frac{1}{2}$ miles of waterway, and various river basins give 86 miles of the remainder.

The CORINTH CANAL is an exactly similar undertaking on a much smaller scale. In fact, it may serve as a model of the rest. It does not cross the isthmus in the narrowest part, or even along the lowest level, the question of keeping surface drainage out of the canal being of the greatest importance ; and it is curious that the course of the present work is almost exactly the same as that of Nero's similar undertaking. The canal can give a much smoother and much shorter passage from Italy to the Black Sea than that round the Morea ; shipping generally must benefit greatly by the improved lighting throughout the Gulf of Corinth which the traffic through the canal demanded ; and some very beautiful and interesting scenery—including Olympia, Delphi, and Parnassus—has been made easier of access.

In every part of the civilised world where water is procurable a similar DEVELOPMENT OF CANAL CONSTRUCTION is going on. In Great Britain, for instance, Manchester is now converted into a seaport by a canal from Eastham Ferry ; in the United States there is a double scheme to unite Philadelphia with New York and Chesapeake Bay with Delaware Bay, thus giving a *direct* waterway between New York and Baltimore ; in Germany direct water communication between Kiel Bay and the Elbe has been provided by the Baltic and North Sea Canal. In the latter case, the dangers of the Sound route are also avoided ; and it is to avoid the much greater dangers of the ill-lit wind-swept Iberian coast with its treacherous ocean currents, that it has been proposed to construct a ship canal from Bordeaux to Cette.

Where it is simply a question of saving time, but the tidal conditions make a canal impossible, recourse is had to a SHIP RAILWAY, as across the Chignecto Isthmus. The

tides in the Bay of Fundy are the highest and fastest in the world ; in Northumberland Strait they do not rise more than 7 feet. Consequently, a canal from the one to the other is impossible ; but a perfectly straight railway is being built, which will convey ships of 2000 tons across the isthmus without any unshipment of cargo. There are two sets of rails, 16 feet apart, each set on the regular 4 feet 8½ inch gauge.

In these cases the question is purely a Geographical one, as is also the question of conveying products (*e.g.* those of Natal or Mashonaland) to the necessary markets ; but the character of the demand for commodities in any given place, and many labour questions, are more purely Economic.

Take, for instance, a question like THE RIVALRY OF AUSTRO-HUNGARY AND GREAT BRITAIN IN SUPPLYING THE MARKETS OF BULGARIA. Austro-Hungarian goods are ousting British in almost every Bulgarian market ; and, as this is as true of Varna and Bourgas—where British sea-borne goods ought to have an advantage over continental land-borne goods—as of Sophia, there is evidently more than a geographical point at issue. No doubt, the increased facilities of transport enjoyed by Germany and Austro-Hungary, since the completion of the through railway service from Vienna, have had considerable effect, especially in favour of the nearer country ; the Austrian manufacturers are at the doors of Bulgaria, while all British goods have to make a three weeks' voyage before they reach even the nearest Bulgarian port, Bourgas. At the same time, the real causes of the decrease in the British trade are probably purely economic. One is the fact that the British manufacturers insist on cash payments, whereas their Austrian rivals give bills at six months. The other is that, as is

usual in a newly opened-up market, such as Bulgaria practically is, cheapness is more considered than quality ; and in this point also the Austrians far surpass the British. It may be added, however, that the disinclination of the British merchant to give bills is in some degree caused by the distrust due to distance from, and consequent ignorance of, the Bulgarian merchants and markets ; and this, of course, is a purely geographical matter.

WAR.

In the case of Bulgaria there is also a political question in the background, involving the possibility, if not the probability, of WAR. War is—from a commercial point of view—an almost unmixed evil. Not only does it utterly disorganise all commerce while it lasts, but the possibility of it, and the preparation for it, involve nations in countless economic absurdities, *e.g.* difference of railway gauge, the hindrance of fortifications to the natural growth of towns, the loss of male adult labour during the period of compulsory service under a conscription, and the enormous taxation necessary to maintain the various military and naval establishments.

WAR has had, however, curious effects on the development of industry and commerce in a few cases. For instance, the wonderful CANAL SYSTEM OF CANADA AND THE RAILWAY SYSTEM OF INDIA were created originally for military reasons; and, thanks to the one, *ocean* vessels can now load grain 2000 miles up country from the coast of Nova Scotia; and, thanks to the other, famines in India have become much fewer and very much less fatal than in former times. It is also largely for political reasons that the canal system of Canada has been so wonderfully supplemented by railways, especially by the Canadian Pacific Railway; and yet the commercial importance of the Canadian railways may be gauged from the fact that, quite contrary to custom, the Government built only a very

small portion of the Canadian system. Of course, every encouragement has been given by the Government to railway enterprise in Canada, nearly £30,000,000 having been spent at different times in the shape of bonuses, and most extensive grants of land having been made in different parts of the country, especially in Central Canada ; but the great Canadian Pacific Railway system was entirely a private enterprise.

THE IMPORTANCE OF THE CANADIAN PACIFIC RAILWAY system is enormous. It provides uninterrupted communication across North America on British territory, and much the shortest route from Great Britain to the east coast of Asia and Australia. Moreover, it has most valuable deposits of *coal* at both ends and *en route* ; and the terminal coal-fields are close to two of the finest harbours in the world, Esquimalt and Halifax, both of which possess graving docks that are capable of holding the largest vessels in existence. In times of possible war, especially with Russia or France, the Suez Canal route to India would be too dangerous, and the Cape route too long ; but the Canadian Pacific Railway would afford a perfectly safe and quick alternative route.

Actual wars with these two countries have had a marked effect on some industries in or closely connected with Great Britain. For instance, the NAPOLEONIC WARS rendered the import of *timber* from the Baltic to Great Britain quite unreliable ; and, at the same time, Lord Nelson completely cut off the French sea-borne supplies, *e.g.* of *sugar*. In consequence, the French commenced to grow beet-root for sugar—to the utter ruin of the Bristol sugar trade ; and British merchants began to import timber from Canada. To this, indeed, Canada owes much of her subsequent prosperity,

for the lumberers were the best possible pioneers of the country—clearing the land, making roads, and bridging rivers.

A similar state of things arose at the time of THE CRIMEAN WAR, when the import of *flax* and *hemp* into Great Britain from Russia was, of course, abruptly stopped. To supply the want, British merchants began to turn their attention to India, and the *jute* industry was commenced which has since then attained such wide dimensions. India reaped advantage also from the American Civil War. That struggle stopped the export of *cotton* from the Southern States ; and this, in turn, caused the most terrible distress among the Lancashire spinners and weavers and the Lanarkshire printers and dyers. To remedy the distress, and to ensure, as far as possible, that it should never occur again, a large area of land in the basin of the Tapti was laid down in cotton ; and it was thus discovered that the remarkable power of the Indian “black soil” to retain moisture, the amount of lime in the soil, and the entire absence of frost, guaranteed—with careful cultivation and harvesting—a plentiful supply of cheap cotton from Bombay. It should be noticed, however, that Indian cotton is short in staple, and therefore of less use than American cotton for spinning fine yarn. It is also, for the same reason, not well suited to the Lancashire mills. At the same time, work in cotton factories in the latitude of Bombay can be carried on for at least eighty hours a week the whole year through without any artificial light. Consequently, the competition of the Bombay mills has ruined the *coarse*-yarn trade of South Lancashire.

Of course, the SHORTENING OF ACTUAL DISTANCES by mechanical means, such as the Suez Canal and the

Chignecto Ship Railway, is of the highest importance; and the SHORTENING OF TIME over such distances, *e.g.* by the introduction of artificial lights along the Suez Canal to enable vessels to pass through by night, still further reduces the cost of carriage. On the other hand, the necessity of crossing the isthmus of Panama by rail instead of by canal, while it shortens the time, increases expense; the Nicaragua Ship Canal, while it will save all the expenses incidental to transshipment of goods, will cause delay by no fewer than six locks.

The importance of MARINE INDUSTRIES in relation to commerce and to defence, as well as to food and to agriculture, is too much taken for granted in Great Britain. The fisheries of the Cornish peninsula and of Brittany have been of equal importance to the commerce and defence of their respective countries; but, while no recognition of this is shown by the British Government, the French spend hundreds of thousands of francs every year on bounties to fishermen. The Canadian Government pursue the same patriotic, if un-economic, policy; and, by their minute and instant attention to the needs of their fishermen, they show that they look upon them as a possible and invaluable Marine in times of national danger.

BRITISH COMMERCE is, however, of such enormous extent that it does receive special attention, partly in the maintenance of a very powerful navy, and partly in the occupation of posts of vantage along the great trade routes. The North Atlantic route, with its abundant supplies of steam-coal in Lancashire and Nova Scotia, does not need such posts; and, if it did, there are none in the North Atlantic. The Cape Horn route is almost equally destitute, the only coaling stations for Chili-bound vessels after

leaving the Azores being Rio and Monte Video ; but the weather by this route is very adverse, and the opening of the Canadian Pacific Railway has practically stopped all traffic to New Zealand *viâ* The Horn. In any case, the only post of vantage held by Great Britain on this route is the group of the Falkland Islands.

The three other great routes—the Suez, the Cape, and the West Indian—need, and have, many such posts. The Suez route is the most important of the three, and is *viâ* Gibraltar, Malta, Perim, Aden, and Point de Galle ; the Cape route is *viâ* (the Azores, Madeira, the Canaries, the Cape Verde Islands *) Ascension and St Helena ; the West Indian route is *viâ* the Bermudas and Bahamas, or *viâ* St Thomas and Jamaica. In all these cases, however, the coal has to be sea-borne ; and, therefore, its price is very much higher than at the pit mouth, *e.g.* along the Canadian Pacific Railway and at its two termini.

The importance of sea carriage to a country like Great Britain is incalculable, but it lies in two facts : the internal trade of a small country that is rich in coal and iron, must merge into an external trade ; and for this sea-ports are the distributing centres. Germany, a large continental power in much the same latitude, and therefore working under much the same conditions, as Great Britain, has very little sea coast. All that little is in the north, and the only open sea ports are in the north-west. Consequently, German goods must seek markets in the same direction as British goods do ; the Elbe becomes naturally the rival of the Thames. The latter, however, is much freer from ice than the former, and has unique tidal conditions. *Cf.* p. 25.

* Not British.

PART II.

THE BRITISH EMPIRE.

THE BRITISH EMPIRE covers about one-fifth of the land of the Globe, and the tonnage of its Merchant Navy is *more* than that of *all* the other countries in the world put together. Excluding *sailing* vessels, the proportion is even larger. The total *steamer* tonnage of the world is estimated at 21 millions; and of that the British Empire owns nearly 12 millions.

The reason for this is that the Empire is an *Oceanic* Empire,—that is to say, an empire the different parts of which are “divided” by oceans. Once that was, or might have been, a drawback; but now, for all *commercial* purposes, union by water is positively *better* than union by land. Of course, some of our Colonies are at an immense distance; but shortening time is the same as shortening space, and our “Ocean Greyhounds” are much faster than most of the Railway “Expresses” of the world. And the cheapness and the comfort of travelling under the Red Ensign are unrivalled.

At the same time, the Mother Country is a tiny land—about $\frac{1}{11}$ the size of India, $\frac{1}{28}$ that of Australia, $\frac{1}{80}$ that of Canada; and her civilisation is old. Some of her citizens cannot obtain work at all, although she throws open her doors somewhat gratuitously to foreigners; others see no hope of making a fortune; others, again, find no sphere in which to gratify their love of adventure. Consequently, year by year more than 150,000 of her sons and daughters seek work, or fortune, or adventure, elsewhere.

THE BRITISH ISLES.

SURROUNDINGS.

Great Britain and Ireland are ISLANDS IN A TEMPERATE ZONE, at a distance of between 50° and 60° north of the Equator. In such a latitude the passage of the sun's rays over any given area is neither *very* fast nor *very* slow ; and his light continues in summer for as much as *seventeen* hours a day, and in winter for not less than *seven*. Moreover, their insular position preserves these islands from great extremes of climate, and especially from any *sudden* change of temperature ; it also guarantees an abundance of moisture.

These advantages are increased by the presence of THE GULF STREAM on every side of the islands. The influence of this ocean current saves Glasgow from having the climate of South Greenland ; and, as warm water evaporates more easily than cold, especially in a latitude where distance from the Equator is compensated by the slower passage of the sun's rays, it also gives the country much more than its fair share of moisture.

Though so favoured in the matter of rainfall, the British Isles are practically in THE CENTRE OF ALL THE LAND ON THE SURFACE OF THE EARTH. Four-fifths of the total 55,000,000 square miles of land are *north* of the Equator ; and London will be found to be almost the exact centre of that area. Consequently, London will

continue for ever to occupy, with regard to the world, the same position which Switzerland occupies with regard to Europe ; that is to say, it must—humanly speaking—always be a transit centre.

Again, the position of the British Isles on the *eastern* edge of the Atlantic not only gives them the full climatic and commercial advantages of the N.E. Trades and the S.W. Anti-Trades, but also brings them into close PROXIMITY TO THE CONTINENT OF EUROPE, the most civilised of all the continents up to the present age. This proximity is much more useful than contact would have been, for the English Channel enables Great Britain to remain quite independent of Europe, and yet to make a full use of it ; it enabled the English farmers to keep sheep in the Middle Ages, when war made sheep-farming impossible on the continent ; and it has preserved England from many of the terrible plagues which have devastated the neighbouring countries. Even when it did not entirely stop invasion, it delayed it considerably, for in olden days ships were too few and too small for any *large* army to be transported suddenly to Great Britain from Europe. For instance, if William the Conqueror had not been delayed for half a year by the necessity of building a fleet, Harold would almost certainly have been victorious in the ensuing war ; and, in that case, the civilising influence of the Normans in England would have been indefinitely postponed.

The advantage of WATER-COMMUNICATION in the days when land carriage was conducted by pack horses, was very marked. It saved time, trouble, and expense,—the latter especially when river and other facilities existed for shipping goods where they were made, and unshipping them where they were wanted. In recent years, when canals are

cheaper, and railways are quicker, than any of the old means of communication, a plain *must* become an important natural line for commerce to move over ; and, therefore, people have crowded on to the plain of Europe, especially that part of it which has both an open sea-coast and mineral wealth. That part is the one nearest to Great Britain,—a fact which makes the German and the Belgian natural rivals of the British merchants. *Cf.* p. 25.

Of course, the whole of Europe has a very large PROPORTION OF COAST-LINE to surface, and this makes communication easy for all the European countries ; but the advantages of this must be greatest to the nation which itself has the greatest similar advantages. The average proportion for Europe is 1 mile of coast to about 200 miles of surface ; that for Great Britain alone is 1 mile of coast to about 20 miles of surface. Consequently, while some places in Europe are nearly 1000 miles from sea, no place in Great Britain is more than about 65 miles from sea.

Nor is this all. THE CONFIGURATION OF GREAT BRITAIN GIVES IT A SERIES OF HARBOURS *vis-à-vis*—the Clyde and the Forth, the Solway and the Tyne, the Mersey and the Humber, and the Severn and the Thames ; and the distance across the country between these harbours is in no case more than 100 miles, while in the case of the Scottish harbours it is not more than 40. Moreover, canals join all the last four rivers together ; and the Thames and the Severn enjoy great tidal advantages, those on the Thames being practically unique. *Cf.* p. 25.

Four of the harbours look eastward, and four look westward ; and the development of North America has made the latter more important than the former, always excepting London. Two hundred miles west of Land's End the

BED OF THE ATLANTIC suddenly falls from 100 to 2000 fathoms,—which is the average for the rest of the way across to Newfoundland; and the fall causes a change of colour and of motion in the waves which is easily distinguished by a practised eye. This change is still useful to vessels sailing eastward, and it was much more useful to them in days when nautical instruments were roughly made, and when ships were so few that there was no fear of a collision except in the narrow waters of the English Channel.

Great Britain has naturally, therefore, enjoyed SPECIAL FACILITIES FOR COMMERCE from the time of Columbus; and, as her size has been too small for the maintenance of her increasing numbers, she has been obliged to send out COLONIES OF SETTLEMENT. These succeed only when sent along Parallels of Latitude, where the conditions of life are more or less similar to those of the mother-country; and this fact made the discovery of North America of immense importance to Europe generally, and to Great Britain in particular. Moreover, the enormous proportion of land *north* of the Equator confines the vast majority of the population to the same area; and the natural westward drift of this population brought its surplus to the eastern shores of the Atlantic, *i.e.* to the point from which the N.E. Trades “carry” across the *narrowest* ocean on the face of the Earth. Cf. p. 10.

The NARROWNESS OF THE ATLANTIC is itself a great advantage to commerce, and it is not the only advantage. Besides being the narrowest ocean, the Atlantic is also the most FREE FROM ISLANDS; and this freedom makes its navigation exceptionally safe, and increases the regularity of its winds. On the other hand, the possession of the few

existing islands—most of which belong to Great Britain—is most useful to a commercial nation.

ENGLAND alone has a COAST-LINE of nearly 2000 miles in length, forming a rough triangle. The *Eastern* side of the triangle is composed of soft rocks which have weathered into a low monotonous line of shore, broken only by the estuaries of rivers; and many of the rivers and the sea itself are, therefore, shallow and shoaly, and the tides over such a surface are slight and regular.

There are four estuaries of importance along this coast—those of the Tyne, the Tees, the Humber, and the Thames. The TYNE and the TEES empty close to one another at opposite ends of a small stretch of Magnesian Limestone, which is backed by rich and extensive *coal* measures. Both the rivers open towards Denmark and Germany, and from both the transport of coal and other wealth is easy and cheap by sea. Newcastle and a number of suburban towns occupy the banks of the Tyne for 12 or 13 miles, and, besides exporting *coal*, manufacture *glass*, *chemicals*, and the *metals*—iron, lead, and zinc—found along the deep river valleys of Northumberland. The Tees drains the great Cleveland *iron* and *salt* field, and the trade in these two commodities has given an extraordinary rapidity to the growth of Middlesborough. Stockton, which used to be the port of the Tees, has been outstripped by Middlesborough, because the former is the farther up the river (*cf.* p. 48). In connection with the general trade of these two estuaries large *ship-building* yards have sprung up at Jarrow and Sunderland, and a large *sail-making* industry has its centre at Hartlepool.

The other two estuaries are those of the HUMBER and the THAMES; and, between the two, Yarmouth Roads afford a safe anchorage. The Humber is the only opening through a long line of coast-uplands; and it leads up through the plain enclosed by these uplands towards the *coalfield* of South-West Yorkshire. Consequently, the port of Hull has a large trade both in agricultural and in manufactured commodities, though it is too far from the coal mines to command all the coal traffic. From its position Hull almost monopolises the English trade with the Baltic. It has also a large fishery, in which its nearest rival is Great Grimsby, on the south bank of the Humber.

The THAMES is the most important, as well as the largest, river in England. As it rises at a height of little more than 300 feet—close to the Severn—and yet runs for more than 200 miles before entering the German Ocean, its navigation is not impeded by swift currents or rapids. The estuary opens into the North Sea, near its narrow exit through the Straits of Dover, through which practically the entire foreign shipping of Northern Europe is compelled to pass; and the Goodwin Sands shut in the largest natural refuge for shipping in the world. LONDON may be said to cover an area of 150 square miles, and to contain a population of 6,000,000! The great drawback to the port is its distance from *coal* and iron; but the river is navigable by the largest vessels afloat to the very heart of the city, its mouth is directly open to the great harbours of Rotterdam and Antwerp, and the city is in direct communication by rail, road, or canal, with every inland part of Great Britain. Harwich, which is just off the northern limit of the Thames estuary, is a packet station for passengers and goods to and from the Continent.

On the *South* coast, or base of the triangle there are no important rivers, but there are three very important harbours. Two of the three, Portsmouth and Southampton, lie behind the Isle of Wight, which thus defends the approach to them from both storms and foes. PORTSMOUTH, which is entirely landlocked, is the chief naval arsenal of the kingdom; SOUTHAMPTON has a very large passenger service, mainly with South Atlantic ports, and ocean "Liners" can now lie up to a railway quay. The third harbour, PLYMOUTH, is on the beautiful estuary of the Plym and the Tamar, and is protected by a huge breakwater. The deep-sea approach from the south-west is guarded by the Eddystone Lighthouse.

Dover, Folkestone, and Newhaven have a large "CROSS-CHANNEL" TRADE, though they can in no sense be called *harbours*; and Falmouth, which is a real harbour, is too far out of the way to be of much importance.

The *West* coast harbours are more important than even those of the *East*, chiefly owing to the ever increasing TRADE WITH NORTH AMERICA. Much the finest estuary is that of the SEVERN, which contains the three great harbours of Bristol, Cardiff, and Swansea, and which has an exceptionally high tide. Swansea and Cardiff are in the South Wales *coalfield*, and CARDIFF exports more *coal* than any other port in the world. The presence of *copper* and *iron* in the neighbourhood, and the ease with which they can be imported, especially from Spain, have given rise to huge metal industries at both places.

Between the North Wales and South Lancashire *coal-fields* is the estuary of the MERSEY. There is a rather dangerous bar across the river, but the enormous *coal* and *manufacturing* wealth of the surrounding country have made LIVERPOOL in some senses the most important city in the

country. Most of the Liverpool trade is with foreign countries, but the city shares with Holyhead the greater part of the Irish trade.

The finest harbour of all on this West Coast is, however, that of MILFORD HAVEN. It is about 200 miles nearer than either Liverpool or Southampton to America ; it avoids the most dangerous part of the present sea-route to America ; it has a harbour the entrance to which is two miles wide, and perfectly free from any bar ; and the demand for a line of good steamers between Canada and France is sure eventually to make Milford Haven a calling port for vessels on that route, especially as there will no longer be any necessity to call at Queenstown.

The coast of SCOTLAND is so deeply indented that its total length is several hundred miles more than that of the English coast ; and the western part of it is even much more broken than the eastern, owing to its being exposed to the force of the Atlantic waves and winds. Indeed, all the softer portions of the west coast have been washed away, leaving an outer barricade of islands and an inner wall of very hard rock, pierced by numbers of sea lochs, in which the herring fishery is very productive. The eastern coast, on the other hand, is mainly formed of sandstone and clay, which are easily worn away—especially round the mouth of a rapid river, *e.g.* the Tay—into deep, wide estuaries.

The principal port of Scotland is GLASGOW, which is on the southern portion of the west coast. It stands on the river Clyde, the Firth of which is a large and very beautiful expanse of sea encroaching into the Lowland Plain and having canal communication with the east coast. Within

the memory of living men the Clyde at Glasgow was fordable on foot. Now vessels drawing over 20 feet are berthed in the very heart of the city, 20 miles from the estuary, the water of which thus forms a harbour of seventy-five acres with three miles of quay.

On the East coast the Dee, the Tay, and the Forth supply three good harbours; and Cromarty Firth gives perfect shelter in stormy weather. The importance of Aberdeen is largely due to its position at the opening of two valleys commanding the internal trade of the north of Scotland; but DUNDEE and LEITH owe their importance almost entirely to their harbours. The Tay pours into the sea a greater volume of water than any other river in Great Britain, and is navigable above Dundee as far as Perth; but Dundee is nearer than Perth to both the ocean and the *coal-fields* of the central plain. The easy communication with the Baltic ports has given Dundee almost a monopoly of the import of *flax* and *hemp*, and this import has also attracted the *jute* trade to Dundee.

Leith, though the port of Edinburgh, the political capital of Scotland, is of much less importance than Dundee. The Forth is navigable far above Leith,—indeed, up to Stirling for small vessels; and the *coal-fields* of Alloa on its north bank, and those of Midlothian and the *ironworks* of Falkirk on its south bank, have attracted a considerable population.

The IRISH COAST is also deeply indented, especially on the western side, where it is exposed to the full force of the Atlantic; and no part of the country can be much more than fifty miles from deep sea. It differs from the coast of Great Britain, however, in several important particulars.

The islands which fringe its northern and western portions, are—unlike those fringing the shore of Great Britain—too small to give much protection ; there is only one good river emptying through the west coast, the Shannon, and that is too far from any populous centre for its port, Limerick, to have any great trade ; the eastward rivers are too small to form good harbours, too much sheltered to have their estuaries kept clear of sandbanks by the rush of the waves, and prevented by the intervening English ports from having any real Continental trade. Indeed, the only natural harbour on the east coast is that of Strangford Lough, which is shut in by the Ards Peninsula ; Dublin Bay, through which almost all the foreign commerce enters the country, is spoilt by sandbanks.

At the extreme N.E. and S.W. corners of the country, however, there are two very important harbours. BELFAST owes its importance to its position on the Ulster *iron-field*, and its close proximity to the Scottish *coal* and *iron* ; CORK is completely landlocked, and stands on the present route of the Ocean Liners between England and America.

SURFACE.

The division of Great Britain into THREE AREAS under different names is not altogether artificial. The disproportion between the length and breadth of the country, and the physical obstacle presented by the Cheviot Hills, gave Scotland naturally a separate political existence ; and the protection of the Cambrian mountains, and the uninviting barrenness of the Welsh moors, favoured the conservation of a separate kingdom west of the Severn. Cf. p. 29.

Great Britain may be divided into BELTS OF LAND,

running from S.W. to N.E. The first includes the SCOTISH HIGHLANDS, and is bounded on the south by a line from Helensburgh to Stonehaven; there the barren slopes of old crystalline rocks are succeeded by the fertile LOWLANDS of carboniferous limestone. These Lowlands break on to the grassy downs which commence a BELT OF HILL AND MOUNTAIN, bounded on the east by a line from Berwick to Exeter. All the rest of the country, *i.e.* the entire East and South of England, is A PLAIN, covered by low limestone or chalk hills, over the south-eastern portion of which the soil is newer and more fertile than elsewhere.

The evaporation off the warm Gulf Stream is, therefore, met by MOUNTAINS along the *west* coast, so that the condensing medium is as near as possible to the point where the wet Anti-Trades first touch land. These mountains, however, expand towards the north, *not* the south; and, therefore, not only is the south-eastern area the most fertile, but also it had no physical barrier to check invaders from the South or the East who were tempted by that fertility. At the same time, the mountains in the North and the West gave a safe retreat to the natives; and thus conquest was always gradual, and the recesses of the mountainous districts became unnaturally well explored.

The GRADUAL PROGRESS OF CONQUEST, *e.g.* in the case of the Saxon invaders, enabled the hostile parties to become acquainted with one another; and the conditions of war caused the number of native young men to be continually decreased, while the invading army was being continually recruited by young men from the continent. Consequently, as the proportion of native young women increased, they compulsorily married amongst the invaders.

The mountains in which the natives took refuge were

along the west coast ; and against them on 225 days out of every 365 the S.W. Anti-Tradés bear their burden of rain. Thus *tin, copper, coal, iron, slate, salt, and lead* were washed bare in the Cornish, Devon, Mendip, Cotswold, Cambrian, Pennine, and Lowther hills ; and, as the rain was heaviest where the ground was highest and nearest to the sea, the MINERALS of Cornwall, Wales, and Cumberland were laid bare before those of Gloucestershire, Lancashire, and Lanarkshire.

Having deposited their burden of rain on the west of these mountains, the winds travelled eastward much drier ; and thus extensive areas on the tablelands of Wiltshire, Warwickshire, Leicestershire, and Yorkshire, grew only the short grass which is specially suited to SHEEP. At the same time, on the Lias plain *west* of the great Chalk Range from Cheddar to Stilton, the richer grass made the counties of Somerset, Gloucester, and Leicester—like the part of Cheshire which is on Lias—famous for CHEESE ; while the Bunter Sandstone *west* of the Pennine Range and of the Dorset Heights made Cheshire and Devonshire famous for BUTTER and CREAM.

The country is so narrow, however, that the variation in the RAINFALL is not very great : the average rainfall of London is 24 inches, that of Liverpool is 35, and that of Plymouth is 40 ; and, considering the latitude, the rainfall is too great and too continuous for wheat *everywhere* except in the East and East-Centre of England, *e.g.* in the basin of the Thames, where it supplies the *biscuit-factories* of Reading. Barley flourishes much better, *e.g.* in the basin of the Trent, where it supplies the *breweries* of Burton, and in the basin of the Tay, where it supplies the *distilleries* of Strathmore.

Moreover, THE NARROWNESS OF THE COUNTRY accounts for the exceptional suitability of inland towns like Manchester and Leeds for *spinning* cotton and wool, which, in a country as dry as Queensland or the Argentine, becomes a practical impossibility; and this has caused the dense concentration of population on the Lancashire and Yorkshire *coalfields*, although they have no direct sea communication as yet. Manchester, however, has now been made an ocean port by its ship canal to the Mersey.

At the same time, this narrowness would have been a great drawback if there had been mountains either along the east coast or down the centre of the island; but, as it is, the position of the mountains along the west coast makes an excellent WATERSHED for comparatively long rivers flowing towards Europe, and flowing over such a gradual slope that they are slow enough to be navigable, and not to bring down too much sand, and not to injure agriculture by floods. Consequently, the HARBOURS at their mouths admit the largest vessels afloat, are kept open with little dredging, and have no obstacle to rail and canal communication inland; and the undulating surface of the slope hinders the formation of marsh, and concentrates the rainfall into great rivers.

The presence of the mountains in close proximity to the sea has another important aspect. They are naturally unfitted for tillage, the products of which are light in bulk; but they are rich in MINERALS, which are so heavy that water carriage for them is a necessity. The manufacturing districts are directly connected with the mineral deposits, especially of *coal* and *iron*; and thus goods are made on or near the sea-coast, with the exception of those made in the Leeds and Birmingham districts.

The distribution and collection of goods inland is carried on by a magnificent railway system radiating from London. Special local services, *e.g.* between Manchester and Liverpool, or between Glasgow and Edinburgh, are said to be unrivalled in the world. Indeed, the excellence of the railway and the coasting services has led to the partial neglect of the canal service of the country. *Cf.* p. 43.

INDUSTRIES.

The INDUSTRIES of the United Kingdom may be said to be five in number—Agriculture, Fisheries, Manufactures, Mining, and Trading; and in the past the Agriculture has been of the greatest importance to ourselves, and the Trading has been of the greatest importance to foreign nations.

At present our COMMERCIAL POSITION is, on the whole, better than that of any other country; but we have come to a critical point, and it may be well to inquire into the character and the causes of our present position.

Our PAST PROSPERITY has been due to a variety of causes, of which the chief are—the geographical position, the climate, the abundance of *coal* and *iron* in easily accessible places and in workable forms, the excellent harbours, the fact that almost all the most valuable mechanical inventions were either invented or first adopted in this country, the character of the people, the abundance of capital, the extent of our colonies and the necessity of keeping up communication with them across the various oceans, a free-trade policy, and the extent to which the English

language is used by the great producers of raw materials throughout the world.

At the same time, it is certain that OUR TRADE HAS IN SOME DIRECTIONS REACHED ITS FARTHEST LIMIT. For instance, several continental nations are now producing at home goods which they formerly purchased from us ; and this will be increasingly the case. Moreover, other countries—partly as a fiscal necessity, partly from economic ignorance—are imposing, and have imposed, high tariffs which paralyse their trade ; and thus our industries decline at the same time that their industries are in an artificial and utterly unhealthy condition. In a few instances, however, *e.g.* with *India* and *South America*, OUR TRADE MIGHT BE EXPANDED to an almost unlimited extent.

These tariffs are, of course, absolutely inconsistent with any scientific DIVISION OF LABOUR ; and this principle is becoming stronger every day. Indeed, it is likely to revolutionise some of the industries of Great Britain. For instance, it is recognised that Canada can produce wheat, New Zealand mutton, and Australia wool, better than other competing countries ; and, as has already been pointed out, ocean carriage is cheaper than land carriage. Indeed, ocean carriage is cheaper than any other form of water carriage ; for instance, 200 tons of flour have been sent lately from Liverpool to London *via* New York, in preference to being sent direct by coastal steamer to London, *cf.* p. 45. (Goods are sometimes shipped thus as ballast.)

Consequently, the question of HOME INDUSTRIES has to be discussed in the light of these very significant facts—that other countries can produce certain things which have hitherto formed a very important item in our home trade,

that they can produce them better and cheaper than we can, and that the long distance transit is all in their favour so long as the goods in question can come by sea. Narrowed down to the utmost, then, the question at issue is practically—*What can we produce well at home which cannot be imported?* And subordinate to this is the question—*What are the necessities of ordinary life in this country?*

Shelter and Artificial Heat we can easily provide ourselves with, and our attention may be confined at present to **Food and Clothing**. Food may be limited to *milk, bread, and meat*; but *fruit and fish* are desirable, and *tea* has become an “acquired” necessity. In the same way, Clothing may be limited to *cotton and wool*; but *silk and flax* are also used for it. Now, it is obvious that *tea, silk, and cotton* cannot be produced at all in this country; and it is being gradually forced on our notice that our climate is too fickle, our land too dear, and our soil too much in need of scientific culture, for us to be able to compete with other countries, e.g. Central Canada, in the production of *wheat*. The same is largely true with regard to *meat*. The import of frozen meat already amounts to about *five hundred million pounds weight* a year; and the import of *bacon and ham* is considerably more than that.

Broadly speaking, the agricultural future of the country depends on **grass and market gardens** on a large scale, especially the production of *potatoes*; and the grass is very much the more important of the two, but it should *not* be used for the production of *cheese and butter*. The use of machinery, the free import of wheat, social advantages, and other causes are drawing all our population into the towns; and the future of the whole race depends on the success with which we face the question of providing the enormous

and rising infant population of our huge cities with plentiful supplies of good *milk* at a price within the reach of all, even the very poorest. Now, milk will not travel ; and, even if it could, it has a most unfortunate power of absorbing noxious germs and elements (*e.g.* from oranges, smoked bacon, or tobacco, standing in the same window). Consequently, imported milk would never be quite free from suspicion ; and, as a matter of fact, foreign competition cannot monopolise the milk trade at all.

At present about 1,400,000,000 gallons of *milk* are produced annually in the country ; and, even if all that quantity were used directly as food, and if every one had a fair share, that share would be considerably less than one pint a day. As a matter of fact, 400,000,000 gallons of the whole amount are consumed in the manufacture of butter and cheese, both of which can be produced better and much cheaper elsewhere (*e.g.* in Ontario). It is, therefore, obvious that, if the question were faced boldly and scientifically, there would be a very large increase in the number of milch cattle in the country. The sanitary condition of dairies and the cleanliness of the workers in them might also be immensely improved, especially in Ireland.

With regard to **Fishing**, it is becoming more and more the practice for it to be carried on at a distance from shore. For instance, the shores of Iceland are regularly visited by British vessels engaged in the *cod* fishery. This practice, of course, brings us into relations—sometimes unpleasant—with Foreign Powers ; and it has revolutionised the social conditions of the industry.

Every small port has a few craft engaged in fishing, but the **great fisheries** of the country are concentrated in a few places ; and England possesses more such places than

Scotland, and Scotland more than Ireland. The conditions which make a great fishing centre are three in number—*proximity* to the best markets, *proximity* to the best fishing grounds, and *proximity* to the fishermen's homes; but the last point is becoming of less importance in proportion as improvements are made in the vessels employed in the industry. Moreover, as the "season" varies at different places, the same boats—if supplied with means of quick movement—can "follow the seasons." For instance, Yarmouth boats will be engaged in the mackerel fishery off the south-west coast of Ireland, in the pilchard fishery off Cornwall, and in the Manx or Shetland herring fishery; and in each case the "centre" is a port from which the distribution of fish can be conducted with great speed and regularity.

GREAT GRIMSBY is "the metropolis of the British fish trade," and possesses the same advantages over Hull that Harwich does over London: it is in purer water and nearer the fishing-grounds of the Dogger Bank, and the introduction of "welled" smacks has made the condition of the water a matter of great importance.

LONDON, as the ideal centre for distribution, collects practically the whole "catch" of the east and south coasts, in Billingsgate market; but any port which is well provided with railway accommodation, and within easy reach of ice (e.g. Leith, which obtains constant supplies of ice from Norway), would be almost equally good. *Salt* and *barrels* are also necessities, the latter especially in connection with the Scotch herring fishery, three-quarters of the whole Scotch herring catch (4,700,000 cwts.) being pickled for export. Besides the ports already referred to, Plymouth, Stornoway, Wick, Fraserburgh, and Peterhead are important centres.

MINING and MANUFACTURES are very closely connected, as the great mineral wealth of the country consists in *coal* and *iron*, *i.e.* fuel and machinery; and, fortunately, in Great Britain these two most important minerals are found side by side, near the sea, and near plentiful supplies of *limestone* for flux. The deposits in Ireland are not large, and are far apart. In England there are three, and in Scotland two, chief coal-fields; and, though Wales only possesses one important field, that one is extremely valuable.

In the **NORTH OF ENGLAND** there is the **NEWCASTLE** coal-field, which extends along both the Durham and the Northumberland banks of the Tyne. On the north bank stand Newcastle itself, North Shields, and Tynemouth; and on the south bank stand Gateshead, South Shields, and Jarrow. The coal lies actually along the river; and the ease with which it can be worked and exported has made the Tyne ports famous throughout the world for *coal*. Indeed, they export more coal than any other centre except Cardiff; and this trade gave rise to the very large *ship-building* industry which flourishes on the Tyne and the two neighbouring rivers, the Wear and the Tees. A great proportion of the coal is now used in the *iron-works* and *ship-yards* of Newcastle, Sunderland, and Middlesbrough; and in the smaller town of Hartlepool a valuable *rope* and *sail-cloth* industry has sprung up in connection with the shipping. The coal and the shipping have also given rise to an enormous trade in *chemicals*,—soda and sulphuric acid.

Between the Mersey and the Humber lies the great **LANCASHIRE AND YORKSHIRE COAL-FIELD**, known also as "**THE COTTON AND WOOLLEN.**" The coal lies along both sides of the Pennine Range, and extends to the south of it

into Derbyshire and Nottinghamshire. As that range is much nearer to the west than to the east coast, the western coal area is much the more convenient for *shipping*; and this fact, coupled with the convenient situation of Liverpool with regard to North America, drew the *cotton* trade to South Lancashire. The *wool* trade depended at first entirely on home supplies of wool, and therefore naturally preferred the Yorkshire moors.

MANCHESTER is the centre of the whole *cotton* trade; Oldham, Blackburn, Bolton, Preston, Burnley, Rochdale, and Stockport are all engaged in *spinning*, with populations varying from 131,000 down to 70,000; Preston and Burnley are the chief *weaving* centres, the former producing the *finer* and the latter the *coarser* fabrics. Relatively, more *dyeing* and *printing* are done in Lanarkshire than in Lancashire. Distribution of the manufactured goods by land is provided for by an excellent railway service, the *L. & N.-W. R.* main line from London to Glasgow running through the coal-field, while *the Manchester, Sheffield, and Lincolnshire* * and *the Lancashire and Yorkshire* run across the Pennine Range from the Mersey to the Humber basin. LIVERPOOL is at present the great port of the whole district; and, in connection with the enormous population behind it, it almost monopolises the American *grain* and *cattle* trades. The imports of *timber* and, of course, of *cotton*, are also very large; and naturally *shipbuilding*, with the usual *metal* industries, is important. Widnes has the chief *copper* smelting works in England; and St Helens shares with Newcastle the *glass* and *chemical* trades.

LEEDS AND BRADFORD are the centres of the *woollen* trade, and are surrounded by a number of large towns such

* The old *M.S. & L.R.* is now *The Great Central*.

as Huddersfield, Halifax, and Wakefield. There is a considerable Division of Labour. Leeds and Huddersfield make *broadcloth*; Bradford makes *alpaca*, *mohair*, and *woollen damasks*; Halifax makes *flannel*, *rugs*, and *carpets*. Leeds has also a *linen* trade, which sprang up in connection with the *flax* culture of Yorkshire; but Barnsley has a more special interest in the linen trade, and draws its main supplies from Russia *via* Hull. There is an excellent railway service through the country from London to Scotland, the *Great Northern* running *via* Doncaster, and the *Midland* *via* the famous cutlery town of Sheffield; and the excellence of the *Midland* mineral traffic, and the distance of the coal-mines from the Humber, cause the surplus coal to be sent to London chiefly by rail.

THE NEAREST COAL-FIELD TO LONDON, however, and the one best provided with canal communication, is that which lies between Coventry and Stoke. The northern part of it is known as THE POTTERIES, and draws its supplies of china clay from the decayed granites of Devon and Cornwall, through-communication being provided by the Great Western Railway *via* Bristol. The southern part of this Staffordshire coal-field is known as THE BLACK COUNTRY. It is shut in on two sides by the Severn and the Trent, and contains the great cities of BIRMINGHAM and Wolverhampton, which are almost entirely devoted to *metal* and *hardware* industries. Wolverhampton, with the neighbouring towns of West Bromwich and Walsall, specialises in *iron*, but almost every kind of metal work in the world is found represented in Birmingham. *Machinery* and *munition* of war bulk most largely; but *wire*, *nails* and *screws*, *scientific instruments*, *gold* and *silver plate*, and *pens*, are also very important item. Two to three thousand tons of Swedish

iron are used every year in the production of *pens* alone. Coventry produces *bicycles* and *sewing-machines*.

Besides these three great coal areas, there are several **SMALL FIELDS** in different parts of the country. The most important are two which lie respectively along the coast of Cumberland and along the south-west course of the Severn. The former lies close to a very valuable deposit of *red hematite iron* in the Furness district of North Lancashire; and, owing to this, **BARROW**, a port between the mouth of the Duddon and Morecombe Bay, has developed, with almost unique rapidity, into one of the largest shipbuilding centres in Great Britain. Whitehaven is the chief *coal* port.

The coal on the west bank of the Severn, *i.e.* in the Forest of Dean, is now more valuable than that on the east bank, *i.e.* along the Avon, as the latter is very difficult to work; but the latter has been, in the past, of even more use to the *shipping*, *sugar*, and *tobacco* industries of **BRISTOL** than the former has been to the *tweed* manufactures of Stroud and other towns along the foot of the sheep-ranged Cotswold Hills. Bristol was a place of very great importance in earlier times, when it was a distinct advantage to a port to be some way up a river; and it may again rise to its former position if full use is made of the opening for developing our trade with South America.

Bristol has, however, some formidable rivals on the west bank of the Severn. Along that bank, in the counties of Glamorgan and Monmouth, stretches what is known as the **SOUTH WALES COAL-FIELD**; and, as it contains very valuable supplies of *anthracite coal*, the ports of Cardiff, Newport, and Swansea have a great advantage over all other ports in Great Britain. Indeed, **CARDIFF** exports more *coal* than any other port in the whole world; and its dock

acreage, in the Barry and Penarth Docks, makes it the third port in the United Kingdom. In 1841 its population was 10,000; it is now over 180,000. In addition to its huge coal trade (11 to 12 million tons a year), Cardiff manufactures an enormous quantity of *tin-plate*, chiefly for export to the United States. The neighbouring port of Swansea is the headquarters of the *copper-smelting* industry of the country, and at Merthyr Tydvil there are large *steel* works; but almost all the copper and the iron ore are imported, mainly from Spain. Most of the tin, on the other hand, comes from Cornwall and Devon, which produce more than any other part of the world, except the Malay Peninsula and, perhaps, East Australia.

THE SCOTTISH COAL-FIELDS lie in the narrowest and the lowest part of the whole country, a fact which gives them particularly easy communication by sea, rail, and canal. The western field lies partly along the Ayrshire coast and partly along the Clyde. In Ayrshire it feeds the *iron-works* and *woollen factories* of Kilmarnock, the latter of which arose in connection with the sheep-farms along the Haughshaw Hills; and the Ayrshire ports of Troon and Ardrossan send large supplies of coal to Belfast. THE CLYDE FIELD has made GLASGOW the second city of the Empire in importance, and the second in the United Kingdom in actual numbers. It is the centre of the *cotton* and *iron* industries, and transacts an enormous proportion of the *foreign commerce* of Scotland. This commerce is largely fed by a number of towns in the immediate neighbourhood, the whole of which are abundantly supplied with *coal* and *iron*. For instance, Paisley manufactures *thread* and *shawls*, Renfrew *silk* and *muslin*, and Johnstone *linen*, while Airdrie, Hamilton, Coatbridge, Rutherglen,

Wishaw, and Motherwell mine *coal* and *iron*. Glasgow itself has very large *engineering works* and *shipbuilding yards*. In the latter industry Greenock, Dumbarton, and Port-Glasgow also share ; and its position at the very mouth of the river has also drawn an extensive foreign trade to Greenock, *sugar* being the staple. Greenock, however, is a declining port.

The eastern field, which is the less important, lies along the two banks of the FORTH, and its southern area stretches through the Lothians. To the east of the Pentland Hills there is little *coal*, and that is mainly confined to the west of Haddingtonshire ; but to the west of the Pentlands there is abundance of *coal*, specially round Bathgate, and there is also a rich *oil-shale* field. West Calder is the centre of the latter, from which *wax* and *paraffin oil* are made. Leith is the chief port of the district ; but Grangemouth is also important, being near the *iron* and *coal* centre of Falkirk. The northern area stretches through the counties of Clackmannan and Fife, and its produce is exported from Alloa and Kirkcaldy to the Baltic and the industrial towns of East Scotland. Dunfermline, which stands in the centre of the area, has an extremely important *linen* trade, 30,000,000 yards of table linen alone being manufactured there annually.

IRELAND has two useful coal-fields ; but both of them are small, and neither is conveniently situated. The Leinster field, where the coal is of a very good quality, has its centre at Kilkenny, the largest inland town in Ireland—with a population of only 11,000 ! The Munster field lies along the lower course of the Shannon, and supplies the little port of Limerick.

The only manufactures of any real magnitude in Ireland

are found in Ulster, where the presence of *iron*, the suitability of the soil for *flax*, and the proximity of the Ayrshire *coal-field*, have developed a very large *linen* industry in BELFAST and a number of much smaller towns in Antrim, and in Londonderry and Armagh.

The most important industries in the country which are not so directly connected with the *coal* and *iron* fields are those in *slate*, *salt*, and *leather*. The *slates* are quarried mainly in Wales, at Bethseda, Llanberis, and Festiniog; the *salt* is obtained from the rock-salt mines of Cheshire and Worcestershire, especially from Nantwich, Middlewich, and Northwich; Northampton is the centre of the *boot* and *shoe* trade, and Walsall of the *harness* trade.

THE DOMINION OF CANADA.

Canada is at present THE MOST IMPORTANT OF ALL THE BRITISH COLONIES, partly because of its geographical position and partly because of its size. It is the largest continuous expanse of land in the world under one flag except China or Russia. When compared with its continental and oceanic neighbours, it is found to be *larger* than the United States, and very nearly as large as Europe; when compared with the Mother Country and her Empire, it is thirty times as large as the United Kingdom, and constitutes almost half of the whole Empire.

SURROUNDINGS.

Canada has SEA ON THREE SIDES; and even on the fourth side, *i.e.* the south, there is a large area of water in

the form of fresh-water lakes. The sea on the north, however, is rendered useless for commerce by the climate. This is specially to be regretted because the islands with which it is studded, are rich in mineral wealth, composed of rock which "weathers" well, and provided with excellent natural harbours. *Cf.* p. 6.

In the north-east corner, however, there is a very important area of sea known as HUDSON BAY. It is several times as large as the area covered by the United Kingdom and the Irish Sea, and its effect on the climate *south* of it is very marked. Its coast-line is comparatively valueless, owing to the climate; and, though the level of the country offers extraordinary facilities for railway construction up to Lake Winnipeg, the rivers which empty into the Bay are so shallow that even the lightest birch-bark canoe has to be unloaded from time to time and carried over shoals. Moreover, as this is due mainly to a "natural" cause—the excessive evaporation off the central lakes, from which the Churchill and the Nelson draw their waters—there is no hope of any real improvement being made in the water-way without canalisation.

The only real difficulty with regard to the Bay itself is the approach from the Atlantic up HUDSON STRAIT. The northern end of the latter is in the latitude of the White Sea, and is therefore shut by ice for more than half the year. Strong steamers specially built for the traffic could, however, keep up a continuous service between Fort Churchill, Fort York, Port Nelson, and Europe for at least four months in the year, including the month immediately *after* harvest; and a line of rail is now being constructed from Winnipeg to Fort York. The advantage of the route, as far as distance is concerned, is very great. Owing to

the much smaller circumference of the earth in the more northerly latitude, Fort York is *nearer* to Liverpool than Montreal is, although the latter is *twenty degrees farther east* than the former; and the journey from Liverpool to Winnipeg is about *a thousand miles* shorter *via* Fort York than *via* New York.

THE EAST COAST is at present the most important of the three, owing to the fact that colonisation came from the east; but it has really fewer advantages than the west coast. Davis Strait is so broad and so deep that it admits a large quantity of ice through into the Atlantic; and thus the coldness of the Labrador current from the Arctic Ocean, the freshness of its water, and the amount of land round the mouth of the St Lawrence, cause that river to be ice-bound for four months every year. Even when the river is open, the navigation is not very safe. Two of the three entrances to the Gulf—Belle Isle Strait and the Gut of Canso—are very narrow; and the meeting of the warm Gulf Stream with the cold Labrador Stream causes dense and frequent fogs over the approach to the Gulf.

THE ROUTE HAS, HOWEVER, IMMENSE ADVANTAGES. The river comes through so many lakes that its waters, though fresh and therefore easily frozen, are too pure to deposit any bar at the mouth of the river; and the bed has been dredged so as to admit vessels drawing 27 feet as far as Montreal, *i.e.* 1000 miles from the Atlantic. Thus Montreal, which is about 300 miles *nearer* to Liverpool than New York is, has been made a *fresh-water ocean port*. Moreover, the river has been so perfectly canalised and provided with ship-canals round its numerous rapids, that a vessel carrying 95,000 bushels of wheat has actually sailed direct to Liverpool from Duluth, a port in the

extreme west of Lake Superior, *i.e.* 2000 miles from the Atlantic.

However, Montreal, like the less important harbours of Quebec and Charlottetown, is ice-bound in winter; but on the Atlantic shore two ports—HALIFAX and ST JOHN—are kept open the whole year through by the influence of the Gulf Stream. HALIFAX is the better of the two, and has thus become the winter port of Eastern Canada. It stands on the ocean, not on a bay; its harbour is very large, deep, and safe; the anchorage is excellent; the entrance is protected by M'Nab Island; the place is strongly fortified, and garrisoned by British troops; no charge is made for dockage; it is connected with all parts of Canada by rail or canal; it has richer land round it, and is nearer to *coal* and *iron*. The inferiority of ST JOHN lies in the absence of *coal* and the extraordinary tidal conditions. The shape of the Bay of Fundy, the smoothness of its "trap" floor, and the pressure of the Gulf and Labrador Streams, cause the tide to rise faster and higher than anywhere else in the world.

THE WEST COAST seems to have a great commercial future before it. Behring Strait is too narrow and too shallow to admit much ice into the Pacific; the warm Japan Stream and Anti-Trade winds beat constantly against it; and there are no large openings such as the Gulf of St Lawrence. Consequently, it is never ice-bound; and, as it is admirably supplied with *coal* and *iron*, its harbours must become extremely important. They are three in number—New Westminster, Vancouver, and Victoria (Esquimalt). New Westminster and Vancouver are on the mainland, Vancouver being the better of the two. It has a large, deep, and safe harbour on Burrard's Inlet; it

has immense supplies of *timber*, *metal*, and *food*; and, as the terminus of the Canadian Pacific Railway, it can always obtain *coal* easily if not very cheaply.

ESQUIMALT, the port of Victoria, is one of the great harbours of the world. It stands on the Juan de Fuca Strait, sheltered from the south-west gales by the Olympian Mountains. It enjoys a beautiful climate; its sea-approach is straight and deep; its harbour is large and land-locked; its wharves are very extensive and lit by electricity; it has most valuable *forests* and *coal*-mines in its immediate neighbourhood, and *accessible by water*; it commands all imports from the west, *e.g. tin* (for the salmon canneries) from the Malay Peninsula, and thus has come to control all exports, *e.g. the salmon*; it is the most convenient harbour for the *sealing* vessels, and thus has developed a *ship-building* industry. It has all the advantages of Vancouver, except continuous communication with the Canadian Pacific Railway; and it has what Vancouver has not, deposits of *mercury* for working its *gold*.

THE SOUTHERN BOUNDARY OF CANADA is partly artificial, but also partly natural—the GREAT LAKES. These lakes are all connected with each other by the St Lawrence and ship-canals; and the trade on them is simply enormous. Lake Superior alone is as large as Ireland; the annual tonnage through the Detroit passage, though the river is ice-bound for four months, is much more than the combined tonnage of London and Liverpool; and the actual number of vessels using the St Mary Canal is three times as great as that of vessels using the Suez Canal. The navigation is, however, rather dangerous. The air over such a huge extent of water, under a cloudless sky, is naturally very moist; and thus warm dry winds from the

south are apt to cause dense fogs, and cold dry winds from the north are apt to cause terrible snow-storms.

The **FISHERIES** off the west and the east coasts are very valuable, the chief products being *salmon*, *cod*, and *herring*. The *salmon* are most plentiful on the west coast, where they specially frequent the Fraser river. They are caught by Indians, and tinned by Chinamen ; and the river is so clear, owing to its having come through so many lakes, that the fishing can be carried on only at night. The *cod* and the *herring* seem to prefer the colder waters of the Atlantic, and are found on the banks over which the Labrador current deposits the millions of minute organisms that it brings down from the Arctic Circle. The east coast has also easier access than the west coast both to markets, *e.g.* New York and Boston, and to supplies of *ice* ; but the smoothness of the water on the west coast greatly facilitates the fishing operations there.

SURFACE.

Canada has **FOUR NATURAL DIVISIONS**—a Forest Region in the east, a Prairie Region in the centre, a Mountain Region in the west, and a Frozen Marsh Region in the north ; and the Prairie Region is much the most important of the four, owing to its intimate connection with the *food* question in the Mother Country. Central Canada can produce a great number of different commercial plants with exceptional success, but the great product is *wheat*.

CANADIAN WHEAT.

CENTRAL CANADA is an enormous plain of very slight elevation, which separates the forest region of the Atlantic

sea-board from the mineral wealth of the Rocky Mountains. It slopes almost imperceptibly from the south, *i.e.* the U.S.A. frontier, down to the Arctic Ocean; but there are three distinct "steps" running across it in the other direction, *i.e.* from the Rockies down to the level of the Great Lakes. The first of these from the east is the Red River plateau, which is practically Manitoba, and its height averages about 800 feet above the sea, rising on the international boundary to about 1000 feet. The middle "step," which includes the Assiniboine and Qu'Appelle plateau, is twice the height of the first; and the third, which includes Alberta and the western half of Assiniboia and Saskatchewan, rises from about 2000 feet to 4000 feet at the base of the Rockies.

The northern part of Central Canada is called THE NORTH-WEST TERRITORY, and has some very valuable grain land; but the latitude and the absence of communication make agriculture rather precarious and transport very expensive. Consequently, at present the great wheat-fields of Canada are confined to latitudes corresponding to those of the United Kingdom.

THE PREDOMINANT FORMATION over this area is cretaceous, with patches of other rock, including volcanic; and a glance at the map will show that the whole area is well supplied with rivers, some of them very long, and all of them flowing towards the Atlantic coast, *i.e.* towards Europe, the greatest market in the world.

The most conspicuous feature in the map is, however, the MASS OF MOUNTAINS along the western sea-board of the country; and a further examination will show that these mountains are broad, very high, increasing in height towards the south, containing no volcanic cones, and cut

across by very deep depressions. As they run north and south near the sea, they will present an almost full face to any west or south-west wind; such winds come off the Pacific Ocean after a course of hundreds of miles over warmish water and under a hot sun, and are therefore saturated before they reach land; and the mountains meet them at the very coast-line, *i.e.* when they are at their wettest. The precipitation of rain is, therefore, very heavy and violent on the lower elevations; and, as there are no volcanic cones, the mass of snow precipitated on the higher elevations has numerous depressions and valleys in which it can solidify into glaciers. These glaciers guarantee a constant supply of water to all rivers which rise in them, and the volume of water in these rivers will be greatest about harvest time, when the heat has gained most power on the ice; and, as the mountains increase in height towards the south and have deep depressions across them from east to west, the greatest precipitation will be where the heat is subsequently greatest, and the rivers which flow from this part of the range will have every opportunity of making their way *eastward* through the depressions.

Once at the foot of the Rockies, THE RIVERS are on the great plain of Central Canada, where their pace gradually decreases until they become navigable without the slightest difficulty; and even where the pace is too fast for ordinary "up and down" navigation, light goods, such as grain, can be sent down on rafts, as is done also on the Danube. These rafts are naturally made of the *timber* which covers the foot hills of the Rockies, and which is very valuable in the middle of the plain, where there is neither wood nor coal; and any heavy articles, such as agricultural machinery, which are needed "up" country, can usually bear the

cost of transport by rail much more easily than *food* can. *Cf.* p. 34.

The same physical conditions which make the rivers so useful for navigation, have also rendered RAILWAY CONSTRUCTION easy and cheap ; and the possession of excellent *coal* on the Atlantic and Pacific coasts, and at intervals along the southern latitudes of the country, has rendered the working of the railways equally easy and cheap. Of course, the Rockies have to be climbed ; but, as the Canadian Pacific Railway crosses them—by the Wapta Pass—3000 feet lower than the (U.S.A.) Union Pacific Railway, the saving of steam power by the Canadian line must be very great.

Besides the direct railway route through the whole country from east to west, and the wonderful water-way from the centre to the Atlantic coast, there are also ROUTES NORTHWARD AND SOUTHWARD. The latter runs up the Red River valley into the States ; the river itself is navigable into U.S.A. territory, and there are two lines of rail along its banks. The northward route is that *via* Hudson Bay and Strait. *Cf.* p. 83.

The facilities for communication in all directions imply the ABSENCE OF MOUNTAINS, even along the U.S.A. border ; and, though this might lead to political trouble which would disturb commercial confidence, it gives free access to air and sun, and makes cultivation by machinery possible. Of course, cultivation of any kind is greatly helped or hindered by the level of the surface ; but cultivation on a large scale can be made profitable only by the use of machinery, especially in a newly settled country where labour is very scarce and dear, and machinery can be used only on a surface like that of Central Canada.

It remains to be seen whether the soil and the climate are suited to the production of *wheat* as a special product.

Wheat is a cultivated grass, the value of which lies almost entirely in the ear; and this makes it top-heavy. Consequently, it requires to have its roots *very* firmly planted in the soil; and it is very sensitive to wind or rain, and especially to both combined. As a grass, it also requires moisture, light, and heat; and, though there are numerous varieties suited to different soils and different climates, to produce any variety in paying quantities sunshine and rich soil are necessities.

Now, the height of the Rockies guarantees that no wet wind can cross them without precipitating its burden of moisture; and, even if it could, on the dead level of Central Canada there is no condensing medium to precipitate *rain*. Moreover, the precipitation of rain obviously frees heat; and, therefore, the S.W. Anti-Trade winds, having left their moisture on the sea-ward face of the mountains, pass on through the deep depressions across the range warm and dry. As they pass over the miles of land in summer, they naturally become warmer and drier; and thus, as the "CHINOOK WINDS," they become of extreme value to the wheat-farmer of Central Canada.

Wind alone, however, will not ripen wheat; and **THE HEAT OF THE SUN**, of course, varies with the latitude. Paradoxical as it sounds, the farther wheat can grow from the Equator, the better it ripens. In the latitude of, *e.g.* the Qu'Appelle valley, the circumference of the Earth is so much less than at the Equator that the pace of the daily rotation is also much less; and, therefore, any given area of land passes from under the sun's rays much more slowly than at the Equator. Moreover, the farther north

you go, the longer is the summer day ; and the length of the day, and the slow passage of the sun over the wheat, cause the ripening to be very continuous and rapid, and yet very perfect. The same two factors also enormously facilitate harvesting. Moreover, the entire absence of both mountains and timber leaves free access to light and air from every side at the same time that it facilitates agriculture and communication.

Being a grass, wheat must have moisture ; being top-heavy, it may be injured by rain falling on it. How else can it obtain the NECESSARY MOISTURE ? From subterranean reservoirs, excavated by frost and filled with snow. The vast extent of land on every side makes the air very dry, and this causes *intense* cold in winter, the absence of vapour facilitating the radiation of heat from the soil at night. This intense cold covers the surface of the land in all directions with a network of cracks, sometimes *several feet* deep ; and these cracks are subsequently filled with snow. The Chinook winds bring Spring so rapidly that the "lips" of these cracks fall in before the snow in them is melted ; and the soil is so finely pulverised by the long and intense frost that it forms an almost air-tight covering for the reservoir of snow beneath. From this source the roots of grain and grass draw sufficient moisture to last them throughout the whole summer, especially if the land is well rolled ; and, of course, the more it is rolled, the firmer are the roots of the plants in it, and the slower is the evaporation from the reservoirs.

Such retention of moisture, however, would be quite impossible in a loose soil ; but THE FORMATION OF CENTRAL CANADA is a stiff clay resting upon limestone, and the clay retains not only moisture, but also everything else which

comes in contact with it. Consequently, upon the sub-soil of clay there is now a rich black alluvial loam, which is practically inexhaustible ; at all events, the same crop has been grown on the same land, *e.g.* at Kildonan, without any artificial manure for *twenty to thirty years*. The richness of the soil, as also its colour, is due to the accumulation through centuries of the droppings of birds and beasts, and the ashes of prairie fires. As the latter generally occur in Spring, the fields of young grain have to be protected from them by a few furrows of fallow.

The only real OBSTACLES TO THE SUCCESSFUL CULTIVATION OF WHEAT in great perfection, and on an enormous scale, have been locusts, summer frosts, and floods. The locusts have, as usual, disappeared before the plough ; but the frosts and the floods are the result of more permanent causes.

The FROSTS are primarily due to the absence of mountains along the north of Canada, which allows the cold winds to blow down from the Arctic Ocean over the wheat fields of the central plain ; and they generally occur during the latter half of August, *i.e.* when the long summer has dried up every green thing on the face of the prairie. Then no moisture is left to be evaporated, and the slightest breeze from the north nips the wheat. The cause of the frosts being known, there is a choice of remedies. One is PLANTING artificial grasses, shrubs, or trees, all of which draw their moisture from the deeper layers of the soil, and therefore can resist long-continued heat much better than the natural grasses of the prairie can. Another is SOWING EARLY ; but, as that necessitates ploughing in Autumn instead of waiting till the Spring, it cannot be done everywhere or in every case. A third is using HARDIER SEED, *e.g.* Fife or North Russian. The most obvious device, how-

ever, is what is known as **SMUDGE-FIRING**, *i.e.* burning damp straw along the north side of the wheat on a frosty night. Straw is of no value in these districts, and the climate is dry enough for it to be left permanently in heaps on the field without its rotting away; the frosty nights are very rare, and almost never come *twice* in the same summer; the number of "hands" on a wheat farm is sufficient to make the work of watching for the frosts very easy during the two or three weeks during which they are to be dreaded; and, as a rule, the wind is so light that there is no danger of the smoke being blown too far. In any case, the wind would be quite harmless after passing the line of bonfires.

The **FLOODS** are due to several reasons. One is the great want of wood to check radiation at night; and, of course, that want can be supplied by planting trees. Another is that ploughed land naturally presents a larger surface for evaporation than unploughed; but, as the area under the plough increases, the wider distribution of the rainfall will relieve the local pressure. The third is the absence of mountains along the south of Canada, which causes the cold winds from the north to meet the warm winds from the Gulf of Mexico just over the slight elevation which forms the International boundary, and from which the Mississippi and Red rivers flow.

In Central Canada, then, there is an enormous area of level, easily-tilled land, with very rich soil, underground reservoirs of water, long summer days, intense frost to clean and pulverise the soil, and practically no rain; the price of land is extremely small, and there is a magnificent system of railways and waterways. Consequently, humanly speaking, merchants can rely on huge, perfect, and constant supplies of wheat from this part of the world.

CANADIAN TIMBER.

EASTERN CANADA produces *timber* and, where the timber has been cleared, *grass*; and the Dominion owes much of her present prosperity to the *lumberers* who cleared the land, made roads, and bridged rivers. The suitability of Eastern Canada for timber and grass is owing to its position between three large areas of water—the Great Lakes, Hudson Bay, and the Atlantic—which affects its climate, especially with regard to the amount of moisture. There is, however, practically no condensing medium for *rain*; so that most of the moisture is precipitated—by cold winds from the north—in the form of snow. This is not so true of Nova Scotia as of the other maritime provinces, and the facilities for export by canals and by sea have caused the Nova Scotia forests to be largely “cleared” for pasture. Indeed, the ease with which stock can reach Halifax from all parts of the province gives the Nova Scotia farmers a great advantage over the farmers farther west. Even in the matter of timber, however, Nova Scotia is favoured—by the number of its canals, its command of sea carriage, and the enormous demand for firewood in the densely populated north-eastern States of the Union.

NEW BRUNSWICK is the most entirely a *lumber* province, and much of the timber is grown along the Restigouche river. The province is very flat; and, though the *air* is too dry for the climate to be unhealthy, there is a vast amount of marsh. This is the home of the *cedar*; and its preference for swamps makes it very useful for boats, fences, and railway “sleepers.” The commonest tree, however, is the *black spruce*, which is strong and light, and grows to an average height of sixty feet with an average

breadth of two feet. The *hemlock spruce*, though less common, is more valuable, as its bark is very useful for tanning purposes. Indeed, the proximity of large hemlock forests to the north of Fredericton, and of pasture along the St John river in the same district, has given that town a large leather industry. The most valuable of all the New Brunswick woods, however, are *pine* and *maple*. The former is soft, light, and free from knots; the latter compensates for its need of good soil by being extremely useful. Its sap gives a large amount of sugar during March; its beautiful timber is in great demand amongst cabinetmakers, and the presence of sugar in it makes it superior to all other wood for fuel.

The cheapness of Canadian timber is due to two facts:—it is cut in winter, when there is no other demand for labour; and it is transported in winter, when THE SNOW can be beaten into excellent temporary roads. Obviously, too, these roads can be made as easily in unsettled parts of the country, where the supply of timber is largest and best, as in settled parts, where the land is being rapidly cleared for pasture and agriculture. The “logs” are dragged to the banks of streams over the frozen snow, and left there for the Spring floods to carry down to the saw-mills. Half the capital of New Brunswick is invested in saw-mills at St John.

THE PROVINCE OF QUEBEC produces *hard* timber as well as *soft*. The hard is grown on the comparatively “soft” rocks of the Notre Dame range, between which and the St Lawrence there is excellent pasture; and, in addition to the river, the main line of rail from Halifax to Quebec *via* Point Levis—the *only* route in winter—runs through the district. The soft timber, which is much the more valuable,

is grown in the limestone valleys that intersect the "hard" rocks of the Laurentian range. Towards Ottawa the species are the valuable red and white *pine*, elsewhere *spruce*, *cedar*, *maple*, and *birch*. An immense trade in the latter is carried on down the Saguenay river to Tadousac.

The centre of the lumber trade in this province is THE CITY OF QUEBEC. There, as at Fredericton, the proximity of hemlock forests and of pasture has given rise to a leather industry—one of the most important on the North American continent.

THE CENTRE OF THE WHOLE LUMBER TRADE of the Dominion is OTTAWA, which draws supplies of red and white *pine* both from its own province and from Quebec. It stands on the Ottawa river about ninety miles from its mouth, and it has canal as well as river communication with Montreal. The mills are at the Chaudière Falls, which are close to the city, and are kept going day and night while the river is open. The abundance of water guarantees protection from fire directly and indirectly, the latter by affording means of lighting the mills throughout by electricity at an extremely small cost. The same men who work in the mills, go up country "log-cutting" when the river is frozen.

The manufacture of the timber also has its centre in Ontario, at DESERONTO, where the Grand Trunk Railway skirts Quinte Bay. This position is admirably adapted for both collection and distribution by rail and by water. The chips provide fuel, or are combined with clay into terra-cotta ware, or are converted into charcoal.

Forests—almost untouched as yet—also cover the west, *i.e.* the wet, side of the Cascade Mountains in BRITISH COLUMBIA. The principal trees are *pine*, *cyprus*, and

cedar; and, owing to the moderate temperature and its slight range, some of them grow to an enormous height without growing too fast to have a good grain. For instance, the Douglas fir, though it grows to a height of 300 feet almost perfectly straight and with very few knots, is tougher than some species of oak. It is, therefore, very useful for masts.

CANADIAN PASTURE.

The great export trade in **cattle** and **cheese** is maintained by the Maritime Provinces, Ontario, and the eastern slopes of the Rocky Mountains, especially those which form the Provisional District of Alberta.

THE MARITIME PROVINCES.—The eastern half of Nova Scotia has poor soil and a damp climate, and is specially well situated for export *via* Halifax; Prince Edward Island produces enormous crops of grass, partly owing to the valuable supplies of "mussel mud" manure found round the shores of the island; New Brunswick has dyked lands along the Bay of Fundy, which produce rich saltish grass, especially between St John and Shepody. *Cf.* p. 25.

ONTARIO has had such an uneventful history that its population is denser than that of any other province; the soil carries very heavy *root* crops and is magnificently watered; the failures among agricultural farmers in the past, owing to gross stupidity in over-cropping the land with wheat, have frightened the present generation into pastoral farming; and the demand for meat and cheese in the British markets has made them turn their attention to cattle. Four-fifths (more than 100,000,000 lbs.) of all the Canadian cheese—and Canada is at the head of *all* cheese—

exporting countries—comes from Ontario, though it is actually shipped at Montreal.

In ALBERTA the number of streams, the slope of the ground, and the climate are very favourable to cattle ; and Calgary, which stands on the Canadian Pacific Railway, has thus become a centre of a huge live meat and dairy trade. The cattle are the more important. In the Eastern Provinces the heavy snow-fall necessitates the housing and artificial feeding of the cattle in winter, and the grass is largely "sown" (Timothy); but in Alberta the snowfall is very light, owing to the *dryness* of the air, and the grasses are all "natural," which do not produce as much milk as "sown" grasses do. Moreover, the dryness of the climate has the remarkable effect on two grasses—"Buffalo" and "Bunch"—of converting them into *hay* while they still remain *uncut*. This *hay* is much more nourishing than ordinary *cut* hay ; and, as the snow is never deep enough to cover it, the cattle can feed over the pastures in *winter*, thus obtaining exercise in the fresh air and requiring little or no house-feeding.

CANADIAN FRUIT.

There is a large field for fruit-growing in many other parts of Canada, especially in Ontario and British Columbia; but NOVA SCOTIA has already become the most famous country in the world for APPLES.

The centre of the industry is Minas Basin, which is in the latitude of Bordeaux. That district combines all the essential conditions for successful apple-growing. Round the Basin rise some pine-clad hills which shelter the slopes beneath them ; the North Mountains keep off storms from

the Gulf of St Lawrence ; the seasons are ideally arranged—late spring, hot summer, and short autumn, the latter checking the flow of sap very shortly after the fruit is picked ; the usual parasites are almost unknown ; the dry climate has a favourable effect on the fruit both before and after picking ; land is cheap ; the same trees will continue to bear fruit for at least fifty years on an average ; markets are near ; and connection with them by rail and canal to Halifax and by steamer to New York is easy and cheap. There is a slight lack of labour, but women and children can do the picking and packing. *Gravensteins* and *Golden Russets* pay best.

In British Columbia, especially round New Westminster, *pears* will probably be most successful. In Ontario *apples*, *peaches*, and *grapes* seem equally promising. The peaches and grapes do best in the semi-marine climate of the Niagara peninsula, especially on the shale formation of Hamilton.

CANADIAN COAL AND IRON.

There are THREE GREAT COAL AREAS—those of Nova Scotia, British Columbia, and the North-West Territory ; but at present coal-mining is practically confined to the neighbourhood of harbours and railways.

The NOVA SCOTIA COAL is found along the north shore of the Peninsula and on Cape Breton Island. The *Island* field is round Sydney, near the narrow entrance to the Bras d'Or Lake ; and its proximity to Louisberg, the most easterly harbour in North America, gives it special advantages. It raises steam very quickly, and makes excellent gas. The *Peninsula* field lies along Northumberland Strait between Pictou and Springhill, in the narrow plain which

divides the Cobequid Mountains from the sea, and across which the Intercolonial Railway runs. It contains excellent coking coal in very thick seams; and the presence of the finest iron ore and pure limestone in the same district has given rise to important iron industries at New Glasgow, Truro, and Londonderry.

THE BRITISH COLUMBIAN COAL occupies a very similar position, and is even more important. It lies—partly inland along the Canadian Pacific Railway near Kamloops, where, however, there is no *water* communication in any direction,—partly along the eastern, *i.e.* the landward, shore of Vancouver Island, at Nanaimo and Comox,—partly 100 miles farther north, in the Queen Charlotte Islands. The facilities for shipping at Nanaimo and Comox are magnificent; the island of Texada, which lies off Comox, is simply a mountain of magnetic iron ore; and the coal itself is better than any other bituminous coal found on the Pacific Coast of the Americas. The Queen Charlotte Islands contain the *only* known deposits of *anthracite*—except a few seams in Vancouver Island—along the whole length of the same coast-line.

THE COAL IN THE NORTH-WEST is generally of poor quality, but of enormous extent. The northern area stretches along both sides of the Mackenzie River, from its mouth to Fort Norman; the central area stretches for at least 400 miles north and 400 miles south of the Peace River, from its mouth up to the Rocky Mountains; and the southern area stretches from the Turtle Mountains along the South Saskatchewan River also up to the Rocky Mountains. The latter is at present much the most important of the three, as the Canadian Pacific Railway runs through the district. Moreover, some of the coal, especially

between Banff and Calgary, is *anthracite* ; and the importance of deposits of *anthracite*, within two days' journey of the Naval Station of Esquimalt, on the great Imperial Route of the Canadian Pacific Railway can scarcely be over-estimated. Most of the inferior coal goes, from Dunmore and Lethbridge, to the mining centres of Montana, *e.g.* Helena and Butte City.

CANADIAN PRECIOUS METALS.

GOLD is worked in Nova Scotia, and SILVER in Ontario ; but the great deposits of both metals are in British Columbia. The gold is found along the Fraser and the Columbia Rivers, specially in the Cariboo section of the Fraser basin ; the silver is found farther down the Fraser, at Hope, where the river is navigable, and along the shore of Lake Kootenay. Abundance of water and of timber has given the British Columbia miners an immense advantage over their Australian rivals ; but the cost of importing machinery is enormous, and there is considerable difficulty in carrying on the work during the winter. See note on p. 103.

ONTARIO contains also the richest deposits of COPPER and of NICKEL in the world. The former are in Algoma, on the navigable waters of Lake Huron, and along a branch of the Canadian Pacific Railway ; and the copper is almost absolutely pure. The deposits of nickel are round Sudbury, where the same branch joins the main line of the Canadian Pacific Railway ; and the impenetrability of nickel-steel armour, the superior toughness and elasticity of nickel-steel over the best mild steel, and the freedom of nickel-plated hulls from corrosion and fouling, make the deposits of immense importance to a naval power like Great Britain.

Amongst other important mineral products of Canada are

GYPSUM AND APATITE, two compounds of *lime*, which are very useful as manure, especially for wheat. The *Gypsum* is exported chiefly from Windsor (Nova Scotia), though there are rich deposits along the Tobique River (New Brunswick), and between Niagara and Lake Huron. The *Apatite* is exported chiefly from Hull, though the deposits run on westward into Ontario, in the direction of Perth and Kingston.

CANADIAN FURS.

The FUR trade is entirely in the hands of the Hudson Bay Company, except as far as *sealskin* is concerned ; and the most valuable furs—those of the *beaver*, *fox*, *mink*, *skunk*, and *musquash*—come from the least valuable land—the rough marshes to the east of the Mackenzie River. They are collected by “Indian” hunters, who are paid in ammunition, tobacco, cloth, &c. The headquarters of the Company used to be at Fort York, but have been transferred to Winnipeg ; and most of the export goes up the Red River valley into the United States. If a direct service is ever instituted between Canada and Europe, *via* the Hudson Bay, the trade will probably return to its original route. *Cf.* p. 83.

N.B.—Recently gold has been found in Ontario and along the Yukon river. The deposits in the latter district are very rich, especially on the Klondyke, but very difficult to reach. In summer they can be reached by river steamer from St Michael's, but in winter there is no communication at all, and in spring and autumn the only route is across the Rocky Mountains from Juneau City. Dawson City, at the confluence of the Klondyke and the Yukon, had a population of 20,000 in 1898.

AUSTRALIA.

SURROUNDINGS.

AUSTRALIA is an island ; but it is so large that it must be regarded commercially as a continent. It occupies an area twenty-five times that of the United Kingdom ; and, in relation to the rest of the empire, it ranks next to Canada in size.

Australia lies between the Indian and the Pacific Oceans ; and Sydney is in about the latitude of Cape Town or Buenos Ayres, which corresponds to that of the Bermudas or Cyprus *north* of the Equator. Warm currents wash its north, east, and south coasts ; on the west there is a cold current, off which evaporation is small and slow. The coast-line is very little broken ; and the indentations which do exist, the Gulf of Carpentaria and the Great Australian Bight, have little effect on the “solidarity” of the whole continent.

This is most true of the SOUTH COAST. In the western half there is absolutely only one harbour—ALBANY, on King George’s Sound ; and, though that is a very important harbour of call for vessels making Australia from the *west*, the country inland from it has practically no commercial value. The eastern half of this coast is much more broken—by Spencer Gulf, the Gulf of St Vincent, and Port Phillip ; but the abrupt cliffs, the heavy swell, and sunken islands make navigation by no means safe. Lighting and buoying are, however, very carefully carried out. On Spencer Gulf there are two very important harbours, PORT AUGUSTA and PORT PIRIE. The latter is at present the chief *wheat* port of Australasia, and has an immense

through-trade to the Broken Hill and Silverton mines. Port Augusta is the outlet of a large *pastoral* area, a rising *wheat* port, and the terminus of the *Great Northern Railway*, which is the southern half of the projected Trans-continental line. PORT ADELAIDE has a fine natural harbour under the lee of Mount Lofty; vessels of any size can enter its outer port, Semaphore, at any time and in any weather.

The VICTORIAN portion of this coast, however, contains the most important harbour, that of PORT PHILLIP, which is in some respects the most important harbour in the Southern Hemisphere. The "Port" is an enormous bay, 40 miles long and 40 miles wide, and contains two smaller bays, Corio Bay and Hobson's Bay, on the latter of which Melbourne stands. At Port Melbourne there is berth accommodation for a whole fleet; and vessels not drawing more than 18 feet can go up the Yarra actually into the very heart of the city. The whole gigantic trade of Victoria in *gold*, *wool*, and *wheat* passes through Port Phillip; and, if there was only *coal* in the neighbourhood, the harbour would be one of the most important in the world. On the other hand, if the Australian Colonies were to forsake their absurd custom of all having a different railway gauge, and were to construct a complete Inter-colonial railway system, *Wentworth*, a small town at the confluence of the Darling and the Murray, would probably be made the centre of the system; and this might have a very bad effect on the trade of Melbourne. Cf. p. 39.

The WEST COAST, from Cape Leeuwin to Cape Leveque, is low and monotonous, and largely protected by a line of coral reefs; but the shallowness of the water, the direction of the prevailing winds and currents, and the strength of

the latter, make navigation difficult and dangerous. The northern half is also subject to violent hurricanes in summer (February), and is very unhealthy. SHARK BAY is the only important inlet, and has thus become the centre of the *pearl* fishery. In the southern part of the coast Freemantle has been made into a fairly good harbour to accommodate the trade up to PERTH, the capital of Western Australia ; and it has a large *salt* industry.

The NORTH COAST, from Cape Leveque to Cape York, contains a series of fine bays. The best is PORT DARWIN, the harbour of Palmerston. It is one of the finest of all the Australasian harbours, being accessible by the largest vessels in any state of tide or weather, possessing natural sites for a dry dock, fortifications, and lighthouses, and having been provided with excellent harbour works. Palmerston itself is quite a small town, and not healthy ; but, as the junction of the Overland Telegraph with the Eastern Cable, and the destined northern terminus of the Transcontinental Railway, it is very important.

The EAST COAST is the best of all. It is protected for 1200 miles by the Great Barrier Reef ; it has a series of good harbours, that of Sydney being magnificent ; it is well provided with excellent *coal* ; and it has the richest resources behind it, and the best means of reaching them. For instance, BRISBANE, ROCKHAMPTON, and TOWNSVILLE have lines of rail running directly inland for several hundred miles. The Brisbane line commands the *coal* and *wool* trade of South Queensland ; the Rockhampton line commands the *gold* and *cattle* trade of Central Queensland ; the Townsville line commands the *gold* trade of the famous Charters Towers and Ravenswood mines. CAIRNS and COOKTOWN have slightly inferior harbours, and are backed

by country too rough for easy railway construction ; but the former commands the immense *tin* trade of Herberton, and exports annually between 15 and 20 million *bananas*. Cooktown has also a large *tin* trade, as well as a trade in *gold*, *rice*, *sugar*, and *bêche-de-mer* ; but its importance is due to its position. It is the most northerly port on the east coast, and it is just opposite the best channel through the Great Barrier Reef.

On the NEW SOUTH WALES portion of this east coast there are several excellent natural harbours, *e.g.* Botany Bay, Broken Bay, and Port Stephens ; but they have been rendered comparatively unimportant by the unique excellence of PORT JACKSON. The latter is an expanse of deep water about 12 miles long and from 1 to 2 miles broad ; the entrance is protected by rocky heights, which are crowned by batteries 300 feet above the sea-level ; Sydney itself occupies a succession of small promontories forming three sides of a square, with a natural wharf of freestone on each side ; the largest vessels in the world can lie close inshore along these wharves ; splendid *coal*-fields lie to the north and the south, at Newcastle and Wollongong ; and the harbour has a splendid railway service, being on the main line from Melbourne to Brisbane, and having direct communication inland.

SURFACE.

Australia is AN ENORMOUS PLATEAU, with a margin of low coast-land on every side except the south. The outer edge of the plateau is formed in most places by a range of low mountains, which often rise abruptly from the coast-land only to break off abruptly on to the plateau. This has a most pernicious effect on the rainfall inland. More-

over, the plateau sinks as it recedes from the coast ; and, though this natural sinking favours the accumulation of water underground in the limestone of which the country is largely composed, the dryness of the soil and the extreme heat give surface water a very slight chance of sinking at all. In the west, where rain depends on *occasional* winds blowing over a *cold* current, thousands of square miles are, and must ever be, barren desert.

The HIGHEST PART of the mountain ridge is in the south-east, where Mount Kosciusko and Mount Townsend rise to a height of about 7000 feet. This is much below the snow-line in that latitude ; and consequently, though the Murray and Murrumbidgee rivers, which flow from this centre, are extremely important for irrigation purposes, for navigation they are comparatively useless.

The COAST DISTRICTS of the continent are naturally in a very different position. Even in the west sufficient moisture is brought to the Darling Range to provide the strip of land between the range and the sea with sufficient rain for *pasture*, if not for agriculture ; and in the north an even unhealthy abundance of rain is brought landward off the Tropical Arafura Sea. The EAST COAST is exceptionally situated. It is backed by the Great Dividing Range, and faces the S.E. Trade Winds, which blow landwards over hundreds of miles of warm sea. Moreover, the mountains—at least, in Queensland, *i.e.* where the heat is greatest—are very near the sea ; and this compensates partly for their want of height. This coast is, therefore, well supplied with rain and rivers ; but many of the latter are simply temporary surface torrents, all are subject to sudden floods, and all are short. Thus they are of no use whatever for internal communication ; and the floods not only make

navigation precarious or even impossible, but also bring down so much *débris* as to do more harm than good to the low-lying agricultural lands.

AUSTRALIAN PASTURE.

With such a deficiency of rivers and rain inland, it is obvious that agriculture must be extremely limited. PASTURE, however, especially for SHEEP, is very much less dependent on the rainfall; and there is sufficient moisture in the interior of Australia to make wool the great product of the country.

NEW SOUTH WALES is far ahead of the other Australasian Colonies as a *wool*-producing country; and, in this connection, it is worthy of notice that it practically monopolises the entire continental river system. Yet even in New South Wales there are vast plains *between* the rivers, where the rainfall is not nearly sufficient even for *grass*. In these places there is a natural growth of *salt-bush*, a semi-desert plant which is said to excel all other sheep-food in its wholesome and nourishing qualities; and, so long as the surface is not too sandy, *the absence of rain is a positive advantage*. The only necessary precaution is to stock the land very lightly for fear of a drought. Even with light stocking, however, pasture sometimes becomes so scarce during a severe drought that as many as 2500 sheep have been killed and *burnt* on a single "run," their skins alone being worth keeping. Nevertheless, the importance of the wool trade has led to a great development of railway construction, *e.g.* the extension of the *Western Railway* as far as Bourke, and the excellence of the *Southern* system in the Riverina.

The same is true of QUEENSLAND. For instance, the pasture of the Richmond and the Darling Downs is so good that the *Northern Railway* has been extended from Charters Towers to Hughenden, and the *Southern and Western* has been extended from Toowoomba to Charleville. The general character of Queensland, however, is more tropical than that of New South Wales; and wherever tropical rain falls, the climate is much more suited to cattle than to sheep. Consequently, the *Central Railway* brings frozen *beef*, not wool or mutton, to Rockhampton. Still, Queensland sheep-farmers have certain advantages in several parts. One of these is the possession of valuable native grasses, *e.g.* the *Mitchell* grass, which can withstand long droughts and recover very quickly after a very small rainfall. Another is that, even on the Pacific, *i.e.* the damp side of the Dividing Range, there is some volcanic formation, *e.g.* on the Rosella Plains in North Kennedy, which affords very healthy pasturage for sheep. A third is that, owing to the lower latitude and the lower elevation of the mountains, more rain is carried inland in Queensland than in New South Wales. Want of water is, however, severely felt; and dams and tanks have done comparatively little to guarantee squatters against terrible losses even in a single dry season. The difficulty may be solved by sinking artesian wells into the limestone formation. For instance, one well has yielded 3,000,000 gallons a day at Charleville.

The best *wool* comes from VICTORIA, where the quality of the grass and the dryness of the air, in the higher latitude, produce a wool that is almost unsurpassed for softness, lustre, and length of staple. The volcanic formation of the Ballarat district is specially beneficial, and in connection with it a rather famous *Tweed* industry has sprung up

at Geelong, where also the sheep *skins* are tanned with *wattle* bark brought from the north of the colony. But the comparative smallness of the colony, the excellence of the railway facilities, *e.g.* round such towns as Castlemaine and Sandhurst, and the bonuses given by Government on *butter* sold in London and Glasgow, have led to a very large development of the dairy industry. In 1897 more than 16,000,000 lbs. of *butter*, valued at £820,000, were exported from Melbourne to Great Britain. The factories, of which Benalla possesses no less than *eight*, are on *co-operative* principles, and the bonuses are paid *after* the sale of the produce.

Pasture is also of great importance to SOUTH AUSTRALIA; but the intense dryness, the scorching winds from the north, and the consequent looseness of the soil—not to mention plagues of rabbits and wild dogs—make sheep-rearing very precarious, and spoil the wool. There is, however, sufficient rain near the south coast, especially in the neighbourhood of Adelaide, to support an export trade in *butter* and *cheese*, most of which goes to the other Australian colonies. It is rather curious that Port Pirie, the great *wheat* port, should be also the centre of the *wool* trade. Port Augusta, though not much farther north, has only 9 inches of rain in the year.

AUSTRALIAN AGRICULTURE.

The AGRICULTURE of Australia is naturally confined to the edge of the tableland and the coastal strips, where the rainfall is much greater than elsewhere and reliable, and where machinery can be imported cheaply. The tableland districts are, of course, the cooler and the drier of the two; and, therefore, they produce plants like *wheat* and

the *vine*, while the coast strip produces *sugar*, *maize*, and *bananas*.

Wheat is grown in all the colonies, but nowhere with great success, partly owing to the foolish habit of overcropping the same land with it year after year; but the yield is everywhere absurdly small compared with the Canadian, and there are many other drawbacks. For instance, even on the Darling Downs the Queensland farmers have to fear floods or drought and "rust"; and even round Gawler, Kadina, and Mount Gambier, the South Australian farmers have to fear also mice and locusts. The South Australian wheat ripens so quickly that hand labour is too slow to harvest it, and the yield per acre is so small that hand labour would also be far too dear. Consequently, the wheat area is further restricted—to districts where machinery can be imported easily and cheaply.

The failure of *wheat* has made farmers turn their attention to the *vine*. The advantages are obvious. The vine has a long root, which enables it to resist drought; the area of land required is small, and therefore the demand for labour is small; the industry demands little capital, while the need of careful and constant attention is most likely to be supplied by men possessing little capital; the stony slopes of the volcanic and limestone Downs, where the climate is perfect for the vine, produce wines of very fine quality. For instance, £60,000 worth of exceptionally fine wine was produced in 1890 in Queensland, mainly from vineyards between Roma and Brisbane. Naturally, this industry has received great encouragement in the densely populated mining districts of Victoria; and, as the volcanic formation is equally favourable to the vine and to gold-prospecting, the important mining centres of Ararat

and Stawell are also the *wine* centres. In the drier air of the Murray District, *e.g.* at Shepparton, Nagambie, and Rutherglen, the crop of the many thousand acres under the vine is converted almost entirely into *raisins*. Indeed, the success of these vineyards and those at Albany, on the New South Wales bank of the Murray, is encouraging the ruined wheat farmers of South Australia to plant vines on the plains and hills round Adelaide. The plain vines produce "Spanish" wines, while the hill vines produce claret. The climate is admirably adapted for curing raisins; and a fair yield of grapes per acre is at least *four times* as valuable as a good yield of wheat.

The **Sugar, Maize, and Bananas** are largely confined to Queensland and the Northern Territory of South Australia, as all three require tropical rains. **Sugar**, which grows best on a fertile marly soil exposed to intermittent sea-breezes, naturally prefers that part of the Queensland coast strip which faces the S.E. Trade Winds, especially the land between Geraldton and Herberton and that round Townsville and Mackay. The great difficulty is the "Labour Question." In the north, where the climate is most suited to the sugar, it is least suited to Europeans, and coloured labour is a necessity; in the south, where the climate is fairly well suited to Europeans, the cane fares so badly that there has been a great decrease in the area under sugar, especially from Maryborough to Brisbane. At Bundaberg, however which is just north of Maryborough, the industry is well maintained, chiefly owing to the large yield per acre (more than 20 tons).

Maize grows all along the Queensland coast, especially on the low land between Brisbane and Rockhampton, and along the northern coast of the continent. The advantages of

growing *maize* are that—it provides food for both man and beast ; it grows very rapidly, two crops being often grown on the same land in the same year ; and this does no harm, as the crop takes very little out of the land, its needs being almost limited to heat and moisture. Moreover, the amount of labour required is very small. * Indeed, on “scrub” lands it is only necessary to burn off the scrub and then to drop the seed into the ash “top-dressing.” The success of the plant depends on the rainfall, the heaviest crops being grown round Geraldton ; but the largest area under maize is on a sheltered plain west of Brisbane, where the smaller rainfall is compensated by the greater freedom from floods.

The **Banana** grows under much the same conditions as maize, and Queensland produces millions of dozens every year. The Cairns district alone produces between fifteen and sixteen millions ; and the only obstacle to the industry is the necessity for regular access to large markets, *e.g.* London and Glasgow.

AUSTRALIAN MINERALS.

Coal exists in abundance on the east coast, and is, in most cases, of a very good quality. There are four chief centres—two in New South Wales and two in Queensland. The **NEW SOUTH WALES COLLIERIES** lie along two rivers, the Hunter and the Nepean ; and there is a probability of good coal being found under the sandstone in the Hawkesbury valley. The most important of the four fields is that along the Hunter, and it has received the characteristic name of “**NEWCASTLE**.” The town of Newcastle itself stands at the mouth of the river, on the edge of a sudden break in the level of the country ; and the coal

was thus laid bare by the heavy rains brought by the S.E. Trade Winds. Exactly the same thing happened at Wollongong and Illawarra, where some of the seams are 600 feet above the sea. At both places extensive harbour works have been carefully constructed, and the facilities for shipping the coal are very complete. Sydney has thus an abundant supply of excellent and easily worked *coal*, both to the north and to the south. The QUEENSLAND fields are almost equally well situated. The more important of the two is at IPSWICH,—also on the edge of a sudden break in the surface level,—which is about 24 miles west of Brisbane. The other occupies a similar position at Howard, about 18 miles north-west of the important coast town of Maryborough. There are several less important coal-fields; one of them is between Maryborough and Brisbane, at Gympie, where it is very useful in connection with the gold mines in the valley of the Mary river; the other is near Emerald, an inland junction on the *Central Railway*.

Gold is found in New South Wales in the limestone formation of Bathurst, where the miners have the advantage of the head-waters of the Macquarie river; but the great gold colonies are Queensland, Victoria, and Western Australia, the latter being specially important because of its great promise. In 1890 it produced only some 20,000 oz. of gold, while in 1897 it produced about 640,000 oz. The chief centres are Coolgardie, Kalgoorlie, and the Murchison river; and the recent extension of the railway from Perth to the two former helps to compensate for their terrible lack of water. The mineral wealth of VICTORIA is almost entirely in *gold*, the western half of the colony consisting of an area of volcanic disturbance in the middle of very old rock. The gravel beds into which

the gold-bearing rocks had weathered are now exhausted, and there is need for science, machinery, and capital to develop the quartz mines; but the latter are much the more reliable. By far the most productive mines are round Ballarat, Castlemaine, and Sandhurst; but Stawell, Ararat, and St Arnaud are also important centres. The fact that some of the richest mines were discovered—naturally—in deep depressions across the Dividing Range, and that the heavy mineral traffic very soon made bush roads impassable and macadamised roads terribly expensive, gave a great impetus to railway extension in Victoria. The lines radiate from Melbourne; and the *Western*, which serves the Ballarat, Ararat, and Stawell gold-fields, runs also to join the South Australian system at Serviceton.

QUEENSLAND has three important *gold-fields*. The richest is in the north, and occupies practically the entire territory north of a line from Mackay to the Flinders river; but its centres are Charters Towers and Ravenswood, both of which are on the *Northern Railway* in the valley of the Burdekin river. The work even at these two centres—and still more on the “Gulf” watershed, *e.g.* at Palmerville—has been much hindered by the intractable character of the ores. The Mount Morgan mines, which are served by the *Central Railway* from Rockhampton, yield unusually pure gold; and there, too, as in the Southern fields round Gympie, *copper* is found as well as gold. Copper is also found in the interior of Queensland at Cloncurry.

Copper is, however, the characteristic metal of South Australia, as *gold* is of Victoria, *tin* of Queensland, and *silver* of New South Wales. The great Burra-Burra mine is now exhausted, but between £200,000 and £300,000 worth of copper is exported yearly from the Wallaroo,

Moonta, and Kadina mines. Owing to the absence of *coal* much of the metal is sent to Newcastle, New South Wales ; but there are large smelting works at Wallaroo, the coal for which comes from Newcastle. As it takes probably *four* tons of *coal* to smelt *one* ton of copper, it is evidently advisable to send the ore to the fuel, not the fuel to the ore ; but the ships which take the ore can bring back fuel.

The *silver* of New South Wales is also exported *through* South Australia, as the Broken Hill and Silverton mines are nearer to Port Pirie than to any other sea-port. These mines, too, were discovered on the edge of a sudden break in the level of the surface. The Broken Hill mine was one of the most valuable *silver* mines in the world ; the shares, which were originally issued at £20, were in 1888 quoted at £396.*

Tin is the characteristic metal of the Malay peninsula, and exists in the continuation of that formation as far as Tasmania. The deposits extend along the Queensland heights from Cooktown through *Herberton* to Stanthorpe ; they appear in the north of New South Wales at Tenterfield and Vegetable Creek ; and they form the great wealth of Tasmania. The richest Tasmanian deposits are at *Mount Bischoff*, where the ore is *quarried* ; and the "Brave West Winds" bring sufficient moisture to work the machinery by *water-power* winter and summer alike. The smelting is done at Launceston, which draws its supplies of *coal* from the collieries along the Lake and the South Esk rivers. Longford is the centre of the Lake valley field, and Fingal that of the South Esk field.

* The Australian export of silver has decreased greatly since 1893.

INDIA.

SURROUNDINGS.

INDIA contains a great variety of geological formation and of climate ; but it may be roughly divided into two parts. The northern area is a low oblong plain, largely shut in by mountains ; the southern area is an elevated triangular tableland, largely shut in by sea. The whole has a vast extent of alluvial soil, abundance of heat, and generally a sufficiency of water. Indeed, the extent of alluvial formation is responsible for the practical absence of minerals * in many parts of the country.

The POSITION of India is half-way between an enormous area of land and an almost equally enormous area of sea. The latter is entirely within the Tropics ; much of it is traversed by warm currents ; and the Arabian Sea for 100 miles off the windward coast of the country very rarely exceeds 100 fathoms in depth. In July, *i.e.* *summer* north of the Equator, the terrific heat over Tibet draws the ordinary Trade Winds back from the S.W. towards Tibet ; and thus these winds bring an immense burden of moisture to be precipitated in India. *Cf.* p. 20

The COAST along this extent of sea is not very accessible. For instance, much of the coast round the Bay of Bengal is simply swamp ; and Bombay is the only really good harbour in the whole country. Elsewhere the regularity of the coast, the presence of sand-banks, and the strength of the ocean and river currents, make the harbours difficult and dangerous. At the same time, several of these harbours, *e.g.* Calcutta, Karachi, and Madras, are extremely useful.

* The production of coal in Bengal and of gold in Mysore is increasing.

BOMBAY is an island harbour opposite the southern entrance to the Red Sea, *i.e.* the Suez Canal. It is the only really safe, large, and accessible harbour in India. It has, however, two drawbacks—one is its distance from *coal*, all its supplies of which have to be imported from Britain; the other is its comparative inaccessibility from the land side. Since the construction of railways across the Western Ghats, however, these natural drawbacks have become of no importance—as long as the British Navy is supreme on the high seas. Moreover, the opening of the Suez Canal has naturally given Bombay a great advantage over all other Indian ports except Karachi; and the trade of the latter is entirely confined to the Indus basin. Bombay is the outlet for all the trade of the rest of Western India, as well as for that of the Deccan and the Central Provinces. Its chief articles of export are *cotton*, *wheat*, and *opium*.

Karachi is the great *wheat* port of the Punjab, and also exports the products of the Western Himalayan region. It is sufficiently far to the west of the Indus estuary to be safe from the constant currents and the periodical floods of the river; and the level character of the land right up into the Punjab has rendered the construction and the working of railways easy and cheap.

CALCUTTA stands on the Hugli, *i.e.* the most westerly of the fourteen channels through the Ganges Delta; and, as its elevation above the river is very little, there is considerable danger from floods. During spring tides, though the city is nearly 100 miles from the sea, a "bore" travels up the river at the rate of 18 miles an hour; and during the summer rains the force of the river current is terrific. Indeed, a series of ports, of which Dacca alone remains, stood on different channels of the Delta before the rise of

Calcutta ; and all were ruined by the caprices of the river. Even now Calcutta is one of the most dangerous and expensive harbours in the world. Still, the fact that it is the capital of British India and the outlet for the gigantic agricultural wealth of the Bengal alluvial plain, makes it a place of unique importance. Moreover, the only Indian *coal* mines of much value are at Raniganj, a small town in the Damodar valley ; and there is a double railway system to serve the two sides of the river system, connection across the river being provided by a railway bridge at the town of Hugli. The great exports from Calcutta are *opium*, *rice*, *jute*, *tea*, and *indigo*.

MADRAS stands on a surf-beaten coast without either a navigable river or necessary shelter ; and, though it has a large trade, especially in *teak* and *sugar*, it is in no sense a natural harbour.

The LAND BOUNDARIES of India offer insurmountable obstacles to invasion and commerce except in the north-west. Along the north the stupendous range of the HIMALAYA MOUNTAINS runs for 1500 miles, with an average height of 17,000 feet and an average width of 150 miles. This huge range, in which at least 100 peaks are about or above *four miles high*, is covered with enormous glaciers. These not only make the range even less practicable, but also supply the water for the magnificent rivers of Northern India, on which the very existence of Indian commerce depends. The three great rivers are the Brahmaputra, the Ganges, and the Indus ; and they provide the soil, the manure, the moisture, the drains, and the carriage for the valuable agricultural wealth of the Indo-Gangetic plain.

The NORTH-EAST FRONTIER is protected by spurs from the Himalayas and by a dense jungle growth ; the

NORTH-WEST is accessible to invasion through two or three deep defiles across the Sulaiman Mountains, especially the Khaibar and the Bolan Passes. All the great land invasions of India have been actually made *viâ* the Khaibar Pass. Of course, the same defile which lets invasion in, will let commerce out.

SURFACE.

The Indo-Gangetic basin is one ENORMOUS PLAIN—HINDUSTAN—shut in by mountains on the north, the west, and the east, those on the north being of gigantic size ; on the south the two river systems break out into the Arabian Sea and the Bay of Bengal respectively, and the edge of a high plateau runs across the country between the two estuaries. The low level of the plain offers every facility for communication by rail, road, and canal, as well as for irrigation and its dependent agriculture ; and the height from which and the rapidity with which the rivers fall, cause an immense amount of alluvium to be carried down by them on to the plains beneath. This is in some ways a drawback ; for instance, the INDUS becomes so choked with alluvium that it is useless for navigation except for quite small vessels. The latter, however, can reach Attock, which is 900 *miles* from the sea ; and the value of the Indus and its four great tributaries for irrigation has made the Punjab, or Land of the Five Rivers, one of the wheat granaries of the world. The GANGES, on the other hand, unlike the Indus and the Brahmaputra, rises on the *southern* slope of the Himalayas, and is navigable for 1200 out of its total length of 1500 miles.

Another evil arising from the low level of this plain is, that the western half of it contains the Thar or "GREAT

INDIAN DESERT. Rain is brought to the country by the S.W. Monsoons, which naturally deposit their burden towards the N.E.; and this fact, coupled with the absence of a condensing medium, causes winds which subsequently deposit literally *yards* of rain on the Himalayas, to pass over Sind without a single shower. In the north-east corner, of course, the contrary happens, as much as 22 *yards* of rain falling there in one year. Indeed, **CHERRA-PUNJI** is the wettest known place on the face of the globe; and the excessive rainfall makes the climate of all Assam so even that the growth of vegetation is most luxurious.

The low elevation and the excessive moisture make the whole of the Ganges basin distinctly **UNHEALTHY**; and, though the moisture is absent in the Indus basin, the height of the Himalayas is so great that the heat is not tempered by cool winds from the north even in winter. At the same time, the fertility of the soil has attracted a very dense population; and motives of economy, the climate, and religious prejudices cause the vast majority of the people to live largely on *vegetable* food. Naturally, too, in such a climate the demand for food and clothing is enormously greater in proportion to the demand for other things than in a temperate country like the United Kingdom. Cf. p. 2.

The whole of the Indo-Gangetic basin may be divided into **FIVE AREAS**—dry hills and dry plains in the N.W., damp hills and damp plains in the N.E., and a medium climate with a medium elevation along the water-shed which separates the plain of the Indus from the plain of the Ganges, and on which *Delhi* stands.

The peninsula of the **DECCAN** is a triangular **PLATEAU**, shut in on every side by mountains—the Vindhya on the north and the **GHATS** on the west and the east. The Western

Ghats are high, steep, continuous, and very near the sea ; and therefore they act as a superb condensing medium to the S.W. Monsoons. Indeed, so complete is the precipitation that the interior of the Deccan often suffers from drought ; and dams and storage tanks are of supreme importance. The Eastern Ghats are too low and discontinuous to act as a good condensing medium ; and the supply of moisture brought off the Bay of Bengal by the "continental" N.E. Trade Winds is very small. The rainfall on the Western Ghats is sufficient to send a number of fine rivers—*e.g.* the Godavari, Kistna, and Cauvery—across the Peninsula into the Bay of Bengal ; but, though they are invaluable for irrigation, the country is too rough for them to be navigable. Moreover, as the Western Ghats are below the snow-line in that latitude, the depth of the rivers is rather variable. Unfortunately, too, the fact that they flood heavily when the new supplies of rain arrive on the S.W. Monsoon, causes them to plough deep valleys for themselves ; and this renders irrigation by gravitation almost impossible except along the coast. Cf. p. 137.

The VINDHYAN RANGE is a double one, the southern line of heights being known as the Satpura range. The Narbada river runs between the two in a direction which allows the S.W. winds to penetrate far inland ; and the same is true of the Tapti, which flows along the southern base of the Satpura range. Access from Hindustan to the Deccan is by a depression across the Satpuras just south of Khandwa, and this is the route followed by the *Great Indian Peninsula Railway*. Khandwa is the junction for Allahabad, Benares, &c., eastward, and for Delhi, Lahore, &c., westward. The direct route from Bombay to Calcutta *via* Nagpur, Raipur, and the Damodar valley *coal*-field runs along the south of the Satpuras.

The two Ghat ranges meet in the NILGIRI HILLS, which are nearly 9000 feet high, and have thus become one of the most important sanatoria in India. Just south of this great height there is an extraordinary break in the level of the country. It is called the Pal-Ghat or Gap of Coimbatore, and joins the low lands of Calicut to those of the Cauvery basin. The railway from Calicut to Trichinopoli and Negapatam passes through it.

As the Deccan is entirely within the Tropics, the actual sun heat is always very great, and the length of the day varies very little. In the south the difference of time between the longest and the shortest day in the year is only one hour, and the difference of temperature between the hottest and the coldest day in the year is only 5° or 6°.

PASTURE AND TIMBER.

Pasture must be limited in a densely populated country; but there is obviously room for it in a country parts of which do not receive a rainfall sufficient for agriculture. In India such a tract of land exists in the Lower Indus basin. A large portion of this is, as already mentioned, Desert; but between the Luni river and the Aravalli Hills there is sufficient moisture for pasture, and there is a constant demand in the agricultural districts for *horned cattle* for labour purposes. Moreover, the dry slopes of the hills and mountains in the north-west are useless for agriculture; and the dryness implies very considerable extremes of temperature, demanding variety of clothing. Consequently, the product of Kashmir is *wool* from both sheep and goats, but mainly from *goats*. *Silk* is produced under entirely different conditions, but it, too,

is found in Kashmir—wild, in the damp jungle of the lower valleys ; and *silk-worms* are bred in the lower basin of the Ganges.

Timber covers much of the mountainous part of the country wherever the rainfall is sufficient. The three most important kinds are *teak*, *sal*, and *sandal-wood*. The *sal* is the hardiest, and flourishes along the Himalayas ; the *teak* is the most valuable, but is confined to the damp warmth of the Western Ghats ; the stony soil, slight moisture, and intense heat of Mysore suit the *sandal-wood*.

AGRICULTURE.

Wheat flourishes on the low dry plains of the Punjab and the elevated dry tableland of the Central Provinces. The centres in the PUNJAB are the great railway junctions of Lahore and Amritsar, though the nearness of the latter to Kashmir and railway facilities have drawn to it and the neighbouring town of Ludhiana a large *shawl* industry. The Punjab *wheat* is sent for export to Karachi *viâ* Multan. The wheat areas in the CENTRAL PROVINCES are on the northern plains—those of the Narbada basin in the north-west and those of the Mahanadi basin in the north-east. The great north-west centres are Sagar, Hoshangabad, and Narsinghpur, all of which have good railway communication ; the great north-east centre is RAIPUR, which stands in the fertile Chhattisgarh plain on the main line between Bombay and Calcutta. Indeed, it is entirely due to railway extension that the Central Provinces have become one of the most important wheat areas in the world. In 1876 wheat lay rotting on the land for want of transport ; now, since the completion of the direct line from Bombay to

Calcutta, the receipts of wheat in Bombay are so enormous that at times the rent for warehouse accommodation runs up suddenly more than 100 per cent. Cf. p. 39.

Rice and **Millet** form the staple food of the local population. Both are nutritious and prolific, but *rice* requires the more moisture. Consequently, while *millet* covers more than half of the whole cultivated area in a dry province such as Madras, *rice* must be grown on hot low land where floods are constant and irrigation is easy. The latter conditions are only to be found in the damp north-east corner of the low Ganges basin, and round the coast. On the Bombay coast the success of *rice*, as that of *teak*, is due to the S.W. Monsoons; round the Bay of Bengal the crop is mainly raised on the deltas of the great rivers.

Cotton has the same climatic connection with *rice* that *wool* has with *wheat*, as it requires a long, hot summer, with abundance of rain and irrigation; and it flourishes best in the Ganges valley and on certain "black-soil" lands of Bombay, the tenacity of the latter in retaining moisture compensating for the comparative smallness of the rainfall. The important railway and waterway junctions of Allahabad and Mirzapur are the centres in the Ganges basin; but the Bengal industry is collapsing, owing to the cheapness and superiority of Egyptian and American cotton and to the persistent adulteration practised. The BOMBAY industry is in a very healthy condition. The soil, especially on the plains of Khandesh, North Berar, and Wardha, is a fertile decomposition of volcanic rock, abundantly supplied with lime; the direction in which the Tapti flows admits the S.W. Monsoons far up its valley; and the railway communication is excellent. Indeed, the conditions are so favourable that a fairly successful attempt has been made

to introduce American varieties of the plant, which have a longer staple, and are therefore more valuable for spinning finer qualities of yarn.

The almost unique commercial position of Bombay city is largely due to *cotton*. Owing to the ease with which *coal* can be imported, the city possesses no less than sixty-five mills, containing about three and a half million spindles and twenty-five thousand looms. Ahmadabad, which stands in the low Gujarat plain, where the *Bombay and Baroda Railway* crosses the Sabarmati river, also owes nearly all its importance to cotton; and it is a curious proof of the moistness of the atmosphere that the Gujarat returns of clean cotton per acre are exceptionally high, though the land is so low that there is no condensing medium for the S.W. Monsoons, and therefore the cotton is largely dependent on *irrigation from wells*. The *finest* cotton in the whole country is, however, grown in Berar, on the plain of the Puma river, which is simply an extension of the "black-soil" Khandesh plain of Bombay. The Puma is a tributary of the Tapti; and Surat, the town at the mouth of the Tapti, gave its name to Indian cotton in the British market. The centres in Berar are Amraoti, Khamgaon, and Akola, all of which are on or connected with the main line from Bombay to Nagpur; and Nagpur itself draws supplies of exceptionally fine cotton from the deep, damp valleys of the neighbouring rivers, especially from that of the Wardha.

Jute grows better on the sand-banks of the BENGAL river system than anywhere else in the world. Like *oil-seeds*, it is somewhat a subsidiary crop to *rice*; but there the similarity ends. *Oil-seeds* are needed *locally* for outward application, food, and lighting purposes; practically,

the whole *jute* crop is *exported*, raw or manufactured. *Jute* is an extremely exhausting crop, and yet it cannot possibly bare the expense of manure. Consequently, it can be grown only on land which is flooded so heavily and so regularly that the alluvial deposit repairs annually the ravages of the crop. These conditions are found best between the lower courses of the Ganges and the Brahmaputra, especially between *Goalpara* and *Purniah*. Naturally, most of the export goes through *Calcutta*; but some of it goes through *Chittagong*.

Opium and **tobacco** are sources of large revenue. The **poppies** are grown in the Ganges valley round *Patna*, *Ghazipur*, and *Benares*, on land which used to be devoted to *rice*. The **opium** is manufactured as a Government monopoly, at *Patna* and *Ghazipur*, and thus it gives local employment to a considerable number of people. This is also the case with *indigo*, which is grown in *Bengal*, *Behar*, and *Madras*. The **tobacco** is grown mainly on the low lands along the *Cauvery* and the *Sabarmati* rivers. The centre of the *Cauvery* valley is *Trichinopoli*, that of the *Sabarmati* is *Kaira*. In the latter district careful and skilful curing has hitherto been wanting, with the result that the demand for the tobacco is confined to the immediate neighbourhood—*Ahmadabad*, *Baroda*, and *Bombay*; in the south the industry is in a much better condition, and there is a large export of *cheroots*.

Tea grows wild in *Assam*. It is one of the hardiest of sub-tropical plants, and different varieties of it flourish equally well on the Himalayan slopes round *Kangra* and in the natural hot-bed of the *Brahmaputra* valley. The *Kangra* tea-gardens are situated in a beautiful valley north-west of *Simla*, and the "Himalayan" climate draws most of the

European planters to this place or to Darjiling, where the climate is nearly as good. The Darjiling valley has abundance of iron in the soil and of vegetable mould as a natural top-dressing, and the slopes are quite steep enough to prevent moisture from settling round the roots of the plant; but all these advantages exist in Assam, and there are others. For instance, the moisture is much greater, and there are forests of *teak*. The latter, or some similar wood which contains no resin or aromatic oil, must be used for the *tea-chests*. The great centres are at Silchar, Sibsagar, and Dibrugarh; and a railway is being built from Chittagong to Upper Assam, to supplement the river services.

At Kangra and Darjiling seed-beds must be protected from extremes of cold and heat, and the demand for quick-growing trees for this purpose hastened the introduction of the *cinchona* into India; but, of course, the *Peruvian bark* of the latter is itself very valuable in Tropical climates.

The reasons for the increase in the consumption of Indian tea in Great Britain at the expense of Chinese are three: it costs less, the China tea having to bear a land-tax which amounts to *half* the total cost of *cheap* teas; it is much less adulterated; and it has a much shorter sea voyage, the latter being a very important point.

Among the peaks of the Western Ghats in COORG and MYSORE, where the water supply is plentiful, the heat great, and the accumulation of vegetable matter in the soil very deep, the main product is *coffee*; and any defect in beans exported from this district is probably due to bad ventilation *en route*, not to the original quality of the beans.

CEYLON.

CEYLON is a mountainous island nearly as large as Scotland, and it reproduces very nearly the climatic phenomena of the Western and Eastern Ghats. **Tea, coffee, and cinchona** are grown under precisely the same conditions as on the main land ; and about one-third of the total export of "Indian" *tea* now comes from Ceylon. There is also a large export of **spices, especially cinnamon.**

Ceylon also contains **precious stones** and minerals, and the **pearl** fishery off the north-west coast is one of the most productive in the world. The most valuable stones are *rubies, sapphires, and cat's-eyes* ; and the most valuable mineral is **plumbago**. COLOMBO, the capital, has been *made* into a good harbour and coaling station—at the expense of Galle ; the best harbour in the island, Trincomali, is comparatively useless owing to its situation on the north-east coast.

BURMA.

BURMA is more than twice the size of the United Kingdom. It consists of the valley and delta of the Irawadi, a low coast strip along the Bay of Bengal, and a wild hill region along the frontiers of China and Siam. The low lands produce enormous quantities of **rice**—*£7,000,000 worth a year* ; and the hills produce very large quantities of **teak**. *Tobacco* and *bamboos* are also important vegetable products ; and the fact that the Irawadi is navigable for at least 200 miles, *i.e.* nearly to the Chinese frontier, makes it the great highway of commerce between MANDALAY and RANGOON.

The TENASSERIM district, like the rest of the Malay Peninsula, is very rich in *tin*. It also has deposits of extremely fine *iron* ores. In the upper basin of the Irawadi there are numerous wells from which *petroleum* bubbles up in apparently inexhaustible quantities; and the same district contains also the most famous *ruby* mines in the world.

SOUTH AFRICA.

The POSITION OF SOUTH AFRICA makes the country of immense value to the Empire, for it commands a most important trade route in the water hemisphere of the globe. Cape Colony contains the only harbour of real value between St Helena and Mauritius or Albany; and in that harbour vessels, before entering the latitudes of "the Roaring Forties," can replenish their supplies of *coal*.

British South Africa includes an AREA (nine or ten times the size of the United Kingdom) between Lake Tanganyika and the south coast of the continent, the greater part of which is wedged in between German and Portuguese territory. In the extreme south, however, where the peninsula projects out into the water hemisphere so as to practically command its greatest trade route, British territory occupies the whole country from the Atlantic to the Indian Ocean.

The GEOGRAPHICAL CONDITIONS OF BRITISH SOUTH AFRICA are superior to those of any other equal area of Africa; but the surroundings even of the British territory are not faultless. The *west* coast is washed by the *cold* Benguela Current; and the S.E. Trade Winds, though

very useful for carrying *trade from* the country, do not carry any *rain to* it. The *east coast* is washed by the *warm* Mozambique Current; but there are *no regular* winds to carry rain landwards, as the monsoons do not reach farther south than Zanzibar, and the S.E. Trades are diverted towards the heights of Madagascar. Consequently, no area of British South Africa *south* of Mashonaland has more than about 50 *inches* of rain a year. The rainfall from the south-east would, however, be much greater than it is, if the Draken-berge Mountains were farther from the sea or high enough to be covered with perpetual snow. Of course, the coastal strip between Port Elizabeth and the Limpopo has a greater rainfall than the rest; but that part is not very healthy.

SOUTH-WEST OF LAKE TANGANYIKA the wet winds off the Indian Ocean can penetrate far inland, and supply the sources of the Zambesi river system. Fortunately, that part of the country—besides being well-watered—is high enough to be generally healthy; and, as the soil is very rich and there is abundance of gold, the countries of the Matabeles and Mashonas seem to have a great commercial future before them. Even in the best parts, however, a certain amount of *coloured labour* will probably be a necessity.

CAPE COLONY.

SURROUNDINGS.

THE COAST OF CAPE COLONY (including Walvisch Bay) is not more than 1400 miles in length, which gives a proportion of only 1 mile of coast to 166 miles of surface, compared with 1 to less than 20 in Great Britain; and huge deposits

of alluvium brought down by the great continental rivers do their best to spoil the few good harbours which have communication inland. The best natural harbour, Saldanha Bay, has neither supplies of fresh water nor communication inland, and is therefore useless except as a refuge during storm.

WALVISCH BAY, which is in the very centre of *German* territory, is an excellent harbour, and commands all the best routes inland. For instance, the distance from the Bay to Vryburg is less than 800 miles, and a line between the two places—for the German part of which a concession has already been granted—would immensely shorten the journey to the Witwatersrandt gold-field. The jealousy of the Cape and the Beira railway companies will, however, probably prevent the necessary land being granted in Bechuanaland to complete the new line from the German frontier to Vryburg.

TABLE BAY is exposed towards the north-west, and is therefore not quite safe during "Anti-Trade" storms; but the harbour is of immense importance to the British mercantile marine, and very extensive harbour works have been undertaken. CAPE TOWN itself might be approached from the south-east *via* SIMON'S BAY; but that approach is equally dangerous, for Cape Agulhas extends a long way seaward *beneath* the surface of the water, strong currents sweep round the Cape, and the meeting of the *cold* Benguela with the *warm* Mozambique Current frequently causes dense fogs. The Bay has, however, such good anchorage that it has been made the headquarters of the South African Station; and the cold current brings abundance of fish to the bay. Cf. pp. 27 and 87.

Amongst the other places of call for the *Castle* and the

Union vessels, Mossel Bay, Port Alfred, and East London are not harbours at all; and, though Algoa Bay is more like a harbour, PORT ELIZABETH is terribly exposed towards the south-east, *i.e.* the stormy quarter.

SURFACE.

Cape Colony is a GREAT PLATEAU, rising in abrupt parallel terraces from a moist coast strip to dry flat-topped mountains like *Table* Mountain. The outermost terrace is very near the sea in the west and south, but towards the east is from 20 to 60 miles inland. The third terrace leads on to a large tableland, nearly half the size of England, called the GREAT KARROO; and, as the average elevation of this is 3000 feet, the rainfall is very slight.

The Nieuwveld Mountains, a continuation westwards of the Draken-berge, form THE WATERSHED of the whole country. From their *southern* slopes flow the chief rivers, the Gauritz, the Gamtoos, and the Sunday. The range rises in height—under different names, Winter-berge, Sneeuw-berge, and Storm-berge—towards the east; and this increase in height is accompanied by an increase in the amount of vapour brought landwards off the *warm* Mozambique Current. Accordingly, the Great Fish river and the other eastern rivers have a more permanent flow than those farther west. The Orange river, which is largely fed only by thunder rain from the *northern* slope of the watershed, is quite useless for navigation, partly owing to its variable volume and partly owing to the presence of a bar at the mouth.

The CLIMATE naturally changes on each terrace with increase of elevation and of distance from the sea; and it

is further affected by the different capacity of the soil and the vegetation in different places for retaining moisture, and thus limiting the range of temperature. For instance, Grahamstown, which stands on the middle terrace, has an exceptionally even temperature because of its heavy rainfall; and, as that terrace is formed of shale or conglomerate rich in alkalies and lime, the *grass* crop on it is superb. The climate also varies with the longitude. The rain in the east falls in summer, in the west in winter; and, therefore, as at Grahamstown, the rain cools the heated air, and the clouds temper the summer sunshine. On the coast, *e.g.* at Port Elizabeth, the increased moisture and heat are as bad for Europeans as the more luxuriant "sour grass" is for stock; but on the inland heights, *e.g.* at Aliwal North, the climate is magnificent, especially in winter. Indeed, the dryness and the pureness of the air, especially the absence of floating matter, make the interior an ideal place for consumptive patients.

PASTURE.

Owing to the scanty rainfall and the rough character of the surface—which also impedes railway traffic, even on a narrow gauge—*agriculture* is not possible except on the coast lands; and, as there is no great mineral wealth either, the colony will never be densely populated. Even for *pasture* the rainfall over the plateau, where evaporation and filtration are so rapid, might be heavier with advantage; and, of course, *sheep* and *goats* cannot live on the coast lands. The latter are, however, useful for *cattle*; and there is a large demand for *transport oxen*, as the ordinary "carriage" over the trackless plains of the

interior is by waggon. Goats are much more numerous than cattle, and are of two kinds—native and *Angora*. The former are very hardy and breed fast, but the latter are much the more valuable. Most of them are kept on the eastern half of the Great Karroo, round Graaf Reinet; and mohair to the value of £650,000 a year is exported mainly by Port Elizabeth. The sheep, like the goats, are of two kinds—native and *Merino*; and in the very dry north-west area the native is even preferred. The *Merino* is elsewhere the most valuable animal in the colony, and the wool export is valued at nearly £2,000,000 a year. The most important sheep farms are, again, on the Great Karroo. The latter takes its name from the Hottentot name for an edible shrub which grows on it, and which provides most valuable food for sheep; the thin red clay of its soil contains also saline elements most useful in sheep-food; and the clayey character of the soil retains and economises the rain which does fall—6 or 7 inches a year. Under such conditions each sheep requires at least 9 or 10 acres of pasture; and even in the best watered districts, where one acre is sufficient, there is great mortality in a dry season. This, however, is largely due to bad farming, *e.g.* overstocking the farms or wearing out immense areas of good pasture by always bringing the sheep to the same kraal by exactly the same route.

Ostrich farming is a most characteristic industry of Cape Colony, but it is in the hands of a few rich capitalists. The reasons for this are that it requires special knowledge, and is so dependent on "fashion" that there is great risk of heavy losses. The wild ostrich has become very scarce; but such a number of tame birds have been bred, to replace the wild ones, that the price of the

feathers has actually decreased, and the decrease in price has largely increased the demand. The centres of the industry are Uitenhage and Grahamstown, on the edge of the middle terrace, where the grass is rather too luscious for *sheep*. Both towns have railway communication inland and with the sea; Uitenhage is on the line from Port Elizabeth to Graaf Reinet, and Grahamstown is on the line from Port Alfred to Pretoria *viâ* Bloemfontein and Johannesburg.

AGRICULTURE.

Naturally, the parts of the country most suitable for agriculture are those which have the *heaviest rainfall*; and even in these *irrigation* is a necessity. This, however, is rendered difficult and expensive by the depth of the channels which the rivers have ploughed for themselves during the floods of centuries; and yet the profits and prospects of agriculture are not such as to encourage lavish expenditure on large irrigation schemes, even with the assistance of Government. Cf. p. 123.

Maize, or "*Mealies*," is the common crop and food of the people. It is naturally confined very much to the coast districts and river valleys; and the only *good* returns are obtained in the south-east between Uitenhage and King (William's Town). Grahamstown, which is almost half-way between the two, has the heaviest rainfall recorded in the colony—about 42 inches.

Tobacco is grown with some success in the south, especially round OUDTSHOORN. There the rich limestone formation, the shelter of the Zwarte Berge and the Lange Berge on the north and the south, the proximity of the sea, and the presence of extensive forests between the sea and

the crest of the Lange Berge, seem to guarantee permanent success to the planters. The port of the district is the open roadstead of Mossel Bay, and the railway centre is Prince Albert. Indeed, the transit accommodation, the rich soil, and the number of streams, make the land between Oudtshoorn and Cape Town one of the most valuable parts of the whole colony; and the climate is perfectly healthy.

Viticulture is, however, the most important agricultural industry, at all events in the west of the colony. The *wine* grows more luxuriantly there than in any other known part of the world, as the dry, warm slopes of the lowest terrace in the south-west supply in that latitude an ideal site for vineyards; and, if only the manufacture of the product was scientifically conducted, there would probably be an enormous development in the *wine* and *brandy* export. There are three centres, all of which have rail communication with Cape Town; and the ease with which *cork-dust* can be imported from Lisbon, and the nearness of Cape Town to England, enable the *fruit* itself to be put on the London market in the most magnificent condition during the winter several weeks sooner than Australian grapes can be. Indeed, one centre is in the very suburbs of Cape Town, along the line to Simon's Town, the most famous vineyards being those of *Wynberg* and *Constantia*. Another, almost equally near, is round **PAARL** and **STELLENBOSCH**, which are on the main line from Cape Town to Kimberley. Paarl produces about 1,500,000 gallons of wine a year, out of a total of about 4,700,000; and Stellenbosch has hitherto produced nearly half of the remainder. Unfortunately, however, the Stellenbosch district has suffered so terribly from the ravages of the *Phylloxera*

that some of the vineyards have been replanted as *orchards*; in other cases American varieties of vine have been imported. The third centre is in the Breede valley, where the yield *per* acre is very large, owing to the scientific culture; but the area under the vine there is comparatively small.

MINERALS.

Coal does exist in considerable quantities, and is *quarried* at Molteno, Cyphergat, and other villages in or near the pass by which the *Eastern Railway* crosses the Storm-berge; but the quality is very poor, and the price—£1 a ton at the “pit-mouth”—is absurdly small compared with that of imported English coal, which varies from about £7 to £12 a ton, according to the distance from the sea. The conditions under which the work is carried on, however, make the cost of production small, and allow European miners to be employed in spite of the heat.

Copper is also found in the colony. It exists in valuable quantities in the old formation of Namaqualand, between the Orange and the Buffels rivers. The centre of the mining is Ookiep, which is connected by nearly 100 miles of mule tramway with the little roadstead of *Nolloth*.

Diamonds, however, are the great mineral product of the Cape, and realise more than £4,500,000 a year, *i.e.* almost half of the total value of the exports of the whole country. The mines are in the blue clay of Griqualand West, which is traversed by the Orange, Vaal, and Hart rivers, and by the *Western Railway* (from Cape Town to Taungs, Vryburg, and Mafeking). **KIMBERLEY** is, of course, the centre of the industry; and its climate is so healthy that half of its population (of 30,000) is European.

The soil in the neighbourhood is a rich red loam, and the water supply by rain (20 inches) and river is sufficient for all ordinary purposes. The best watered land, and that most favourably situated also for irrigation, is the low plain between Barkly West and Warrenton in the fork of the Hart and Vaal rivers.

BASUTOLAND.

WHEAT.

BASUTOLAND is a high plain, about twice the size of Yorkshire, *west* of the Draken-berge. The Caledon river forms its western boundary, while the Orange river drains and waters the central plain of the country; and the height of the Draken-berge (10,000 feet) guarantees both a splendid climate and a supply of water even in mid-winter. Unfortunately, Europeans are forbidden to settle in the country, and the Basutos themselves are more inclined to pastoral than to agricultural farming; but both climate and soil are excellently adapted for **wheat**, and the British Resident at Maseru is paying special attention to the development of all the resources of the country.

NATAL.

SURROUNDINGS.

Natal is about two-thirds the **SIZE** of Scotland; but it has only 200 miles of **SEA-COAST**, and that is all on one side, the south-east. Moreover, in the whole length of it there is only **ONE HARBOUR**, **DURBAN**; and, as that one

monopolises not only the entire foreign trade of Natal, but also much of the Transvaal and Orange River trade, it has become one of the most important places in South Africa. Indeed, if the Draken-berge were not such a formidable obstacle, Durban would be the natural outlet for all the trade of the two new colonies. The bay of Port Natal is, however, by no means an ideal harbour, as there is a shifting bar across the entrance and the water inside is shallow. Durban itself is well protected by a spur of land which juts out south-eastward into the bay.

The height of THE DRAKEN-BERGE varies from 6000 to 10,000 feet, and there are only a few steep passes across the range. A large traffic has, however, been carried on (export and import) by means of these passes, oxen—the usual beasts of burden in the colony—being as much surerfooted as they are slower than horses. Now a line of rail has been constructed through the Van Reenen Pass on to the tableland, where the present terminus is Harrismith; and, as the gauge is only 3 feet 6 inches, the expense of making and working the line has been minimised.

The frontier in the north-east and south-west presents no obstacle to traffic; and, as almost all the land in both directions belongs to the Empire, this is a distinct advantage.

SURFACE.

The SURFACE of Natal, like that of Cape Colony to the west and that of Zululand to the east, rises in steep terraces, the innermost terrace being from 80 to 120 miles from the sea.

The height of the innermost terrace, which is practically the Draken-berge, and its nearness to the *warm Mozam-*

bique Current, guarantee a much greater rainfall (including some *snow*) than in Cape Colony; and the steepness and frequency of the terraces, though it makes continuous navigation impossible, even on the largest rivers, supplies abundance of water—"power" for motive and irrigation purposes. The heavy rains have, however, cut up the surface so much that navigation, even between the Falls, is impossible; and they have also caused the rivers to plough such deep channels that irrigation by gravitation—the only cheap method—is in some places impossible. The heaviest rains fall in summer during thunder-storms, when the thunder-clouds temper the summer sunshine; the smaller rainfall in winter is sufficient for ordinary purposes, as the sun's heat is so much weaker. Cf. pp. 135 and 137.

The character of the country, however, naturally gives rise to a considerable variety of climate and productions; and, fortunately, Europeans can work with impunity everywhere except on the coast strip. There, too, the productions are of a kind for which cheap labour is absolutely essential, *e.g. sugar*; and this can only be provided by coloured labourers, natives or coolies. The native population is proportionately very large, 720,000 out of 830,000; but, as it is composed mainly of Kafirs who have fled from the tyranny of their native chiefs, and whose wants are limited to food, drink, and a small apron, native labour is almost unprocurable. The coolies work well, but are much given to drink. Cf. p. 2.

The coast strip, which is from 25 to 30 miles deep, has naturally semi-tropical climate and productions; and, as the soil is generally a light sandy loam with patches of clay and abundance of organic matter, it is well suited to *maize, sugar, tea*, etc. **Maize** is, of course, largely culti-

vated for food, especially in the eastern half. **Sugar** cultivation has considerable attractions for small farmers, and forms the principal product of the colony; and, in connection with it, great quantities of *rum* are produced.

The two chief *sugar* centres are Isipingo and Verulam, both of which have direct rail to Durban. **Tea** is largely confined to the Lower Tugela district, where the area under the crop has increased six-fold in the last six years. Most of the product is sent up country. This coast strip is also rich in **timber**, much of it being *Eucalyptus*, which has been extensively planted from sanitary as well as from commercial reasons.

Above the coastal terrace there is a wide stretch of rich loamy "MIDLANDS"—round PIETERMARITZBURG, Richmond, and Greyton—which is used for mixed farming; and behind this are the UPLANDS. *Cattle* (for draught) and *horses* are reared in the midlands, where they are free from lung diseases, which are so prevalent on the coast that *mules* have to be employed on the sugar plantations; and *sheep* and Angora *goats* are reared on the uplands, the goats thriving on the higher and drier land and requiring the less attention. The total export of **wool** and **mohair**, which—unlike the cattle trade—is entirely in the hands of Europeans, is valued at about £550,000 a year; and, in connection with a large *skin* trade, extensive plantations of *wattle* are being made for *tanning* purposes. About £17,000 worth of wattle bark were exported to England in 1897.

The only MINERAL wealth of the colony is in **coal**, which is confined to the extreme north. There, on the upper waters of the Buffalo tributary of the Tugela, good *coal* has been found at Newcastle and Dundee. Ladysmith—which is the junction for the Transvaal traffic with the main line

from Durban *viâ* Pietermaritzburg to Harrismith (Orange River Colony)—is the commercial centre of the district, and has rail communication with the mines.

BECHUANALAND.

The CROWN COLONY of Bechuanaland is a fine plateau shut in on the north and the west by the Molopo river and on the east by the Transvaal. It is very healthy, and—in spite of the extreme dryness—much of the soil is so rich that successful pastoral and agricultural industry is quite possible *with* irrigation : and where, as along the Setlagoti river in the north-east, there is really abundance of grass, wood, and well-water, the country is admirably adapted for *stock*-farming. The three chief centres of population—TAUNGS, VRYBURG, and MAFEKING — are all along the eastern border, and all have direct rail to Cape Town and Port Elizabeth. Taungs and Mafeking have also river accommodation—the Hart and the Molopo respectively. Taungs, as the farthest south, collects *maize*, *pastoral products*, and *wood* for Kimberley ; Mafeking, as the farthest north and the original terminus of the railway, trades with the natives of the Bechuanaland Protectorate and the miners of the Transvaal. The only central town is Kuruman, near which the “blue limestone” formation produces a “sour grass” on which no stock can thrive and milch cows actually die.

The PROTECTORATE reproduces the main features of the colony, all its valuable land being towards the east along the Limpopo river. Indeed, in the west is the Kalahari Desert. In the south-east round Kanya, the plains of the

colony break into undulating land, covered with excellent grass and well wooded. In the north-east, round the now ruined Shoshong, the land is equally good; and, if the summer rains were properly stored, much might be done by irrigation, though the soil is rather porous. The whole country is within the sphere of the British South Africa Company, who may be trusted to take care of their own interests; but European emigrants, especially those of British extraction, cannot compete with the natives or the Boers in such a country.

The area of land known as **KHAMA'S COUNTRY** also comes within the British South Africa Company's sphere. Khama himself is an intelligent Christian, and is ruling the country round Palapye—to which he moved in 1889 from Shoshong—with very great ability. He is planting immense areas with “mealies” and even with European fruits and vegetables, to supply the European miners who are travelling to the Matabeleland and Mashonaland gold-fields by the new railway *via* Palapye and Mafeking.

MATABELELAND AND MASHONALAND.

These two countries are not yet properly settled, but they are of extreme importance. There is no doubt that both are, on the whole, perfectly healthy for Europeans with reasonable precautions—that both are magnificently watered—that the soil of both is exceptionally fertile, the crops of *maize* and *Kafir corn* being enormous—that both are distinctly rich in gold, Matabeleland especially round Bulawayo and in the quartz and blue slate formation of Tati, and Mashonaland especially at Hartley Hill, Fort Salisbury, and Fort Victoria. Mashonaland is the better of the two;

the soil is richer, the water supply more constant, the distance from the sea—*via* the new Pungwe Valley Railway—less, the gold-fields larger, the natives more peaceful and industrious, and the particular products more immediately useful. For instance, the dense *timber* will be most useful in the mines and for building purposes, especially as some of it is hard enough to resist the ravages of the white ant ; the quantity of *fruit* (from *lemons* to even a species of *date-palm*), *game*, and *honey*, will help to supply the immediate demand for food ; and the presence of extremely good wild *tobacco* has special significance in view of the fact that the country will be developed by a mining population.

NEW ZEALAND.

SURROUNDINGS.

New Zealand is sometimes called "the Britain of the South," and there are many points of resemblance, *e.g.* its maritime position, its coast line, its division into two large islands, its scenery, its size, and its climate ; and this causes the productions of the two countries to be very similar. New Zealand is, however, much nearer to the *nominal* Equator ; its *northern* half is the hotter ; it is much farther from the nearest land ; it is in the centre of a water, not a land, hemisphere ; and it draws some of its revenues from very different sources.

The **POSITION** of the islands is directly in the path of constant west winds blowing over thousands of miles of sea, and this sea for a long distance *westward* is shallow and warmed by equatorial currents. Consequently, the coasts

are never blocked by ice, and the range of temperature is slight ; but the proximity of the cold Antarctic water, the great length of the colony compared with the breadth, the large proportion of coast, and the division of the land by Cook Strait, cause many points of the islands to be liable to severe storms of wind. The distance of the colony south of the Tropics saves it, however, from cyclones.

The COAST is very long and very broken, but the harbours are irregularly distributed. For instance, on the west coast of the South Island there is no natural harbour, though some of the mountain-locked fiords supply good shelter in bad weather. Even in the North Island, where the mountains do not run so closely along the shore, drift sand and the prevailing west winds spoil the otherwise good harbours, *e.g.* Manukau. On the east coast there are at least two good harbours in each island—those of Wellington and Auckland in the North Island, and those of Christchurch and Dunedin in the South Island. Russell, in the extreme north of the colony, and Campbelltown, in the extreme south, are also important harbours. PORT LYTTLETON, the harbour of CHRISTCHURCH, has the largest trade of all New Zealand harbours, partly owing to the density of the population behind it, and partly owing to its excellent accommodation for vessels. It has two breakwaters, enclosing 100 acres of harbour with $2\frac{1}{2}$ miles of wharfage ; and the approach is very safe, being—like the approach to all the east coast ports—well lighted and sheltered by the island itself from the “ Brave West Winds ” in “ The Roaring Forties.”

PORT CHALMERS, the harbour of DUNEDIN, is equally good. It is connected with Dunedin both by water and by rail, its wharfage is excellent, it possesses one of the

largest graving-docks in the Southern Hemisphere, and is near excellent *coal* at *Mosgiel*.

PORT NICHOLSON, the harbour of WELLINGTON, is really on Cook Strait, which has one or two other excellent, but less important, harbours, *e.g.* Nelson and Blenheim. It is a land-locked bay with deep water throughout ; it has a convenient quarantine station on an island out in the bay, and is, of course, the port of the capital of the colony.

AUCKLAND has practically two harbours, as the isthmus on which it stands is only six miles wide. Onehunga, however, the western port, is on Manukau Harbour, and thus is comparatively useless. Waitemata, the eastern port, has very large docks ; and, as the main line of rail northward must cross the Auckland isthmus, a very considerable trade must pass through the city.

RUSSELL is a really fine natural harbour, sheltered by 100 islands ; vessels of any tonnage can make the port in any weather and at any state of the tide ; and there is good *coal* four miles distant by water. CAMPBELLTOWN enjoys similar advantages, except that its *coal* is rather farther away and has to be carried by land.

SURFACE.

The NORTH ISLAND is hilly throughout, but the elevation is greater in the eastern half than in the western. Its highest peaks are, however, volcanic ; and the shape prevents the formation of glaciers on their sides. In such a latitude this is no drawback, as the ordinary rainfall is sufficiently heavy and regular to maintain the rivers even during the summer. The height of the surface, the direction of the mountains north and south so that they present a full face

to the west winds, and the narrowness of the country, make these rivers too short, too liable to floods, and too rapid to be of any use for navigation.

The SOUTH ISLAND is rather larger than the North Island, and more marked in its features. It is traversed throughout its entire length by a range of high mountains, called the Southern Alps, which hugs the west coast. The nearness of this range to the sea, its height, and the character of its formation, cause precipitation to be very complete and very sudden, and admit of the existence both of very large glaciers in the range and of considerable plains along its eastern base.

PASTURE AND AGRICULTURE.

ENGLISH grasses naturally thrive wherever there is light and moisture; and the mild, insular climate enables growth to continue practically throughout the whole year, and obviates the necessity for winter-housing of stock. Moreover, much of the reclaimed land—at least, in the North Island—was of volcanic formation, hilly, and covered with dense bush. Volcanic soil produces very good grass, and is very healthy for stock to feed over; the New Zealand rainfall is so regular that there is no hesitation in “felling” the bush; the cheapest method of felling is by *burning*, and the potash makes an excellent top-dressing for grass. The only necessary precaution is not to put on to “burnt” land sheep bred on open land, for they break their legs over the stumps or get caught in the forks of fallen trees. There is a certain amount of cattle-farming, but the regular stock is *sheep*; and the staple products of the colony are *wool* and *frozen mutton*, the former to

the value of £4,500,000, and the latter to about one-third of that sum.

Grain is grown in considerable quantities, especially on the plains of the South Island. *Wheat* does best in the warmer and drier provinces of Wellington and Marlborough; *oats* does best in the colder and damper provinces of Canterbury and Otago.

Timber and **flax** are, however, the characteristic products of New Zealand. Thick forests cover the centre of the North Island and the western slopes of the Southern Alps. The most valuable tree is the *kauri pine*, which grows on steep, clayey banks near the sea; it supplies both *timber* and *gum*. The *timber* is very tough, straight, and durable, without being hard to work; the *gum*, which strongly resembles *amber*, is dug up on the sites of old kauri forests—sometimes from a great depth—and is converted into jewellery and into expensive kinds of varnish. The *timber* along the Southern Alps is extremely useful for the shafts, tunnels, and galleries of the Nelson and Westland gold-mines; and to the east of the Alps there is a considerable area under fruit-trees, especially on the plain of Nelson and along the Clutha valley in Otago. The low alluvial plain, the complete shelter afforded by two spurs of the Alps, and the rather moist even climate of Nelson, favour the *peach*; in the Clutha valley the greater extremes of climate favour the *apple*.

In connection with these areas of *timber*, and with the *meat* trade of the colony, a considerable **tanning** industry has sprung up, especially round Christchurch, the most useful barks being those of the *birch* and the *tanekaha*. The *bark* of the latter is largely exported to France—*via* London—for dyeing kid gloves; and, for that purpose, it fetches £50 a ton.

The PHORMIUM or *flax* grows in the Waikato valley. The river is nearly 200 miles long, but is too rapid to be practically navigable ; and, even if it were really navigable, it empties through the wind-beaten, sand-clogged west coast. Its great use is, therefore, as a drain and a fertiliser. Where its banks are low, it overflows and forms huge marshes. In these the *flax* grows with remarkable luxuriance. It is very tenacious and durable, but somewhat coarse. Consequently, it is used mainly for *rope*-making. About £30,000 worth was exported in 1897.

MINERALS.

The mineral wealth of New Zealand is practically confined to **coal** and **gold**. The **coal** is found in several parts of both islands, and most of it is very conveniently situated. For instance, in the NORTH ISLAND a line of *coal* runs from Russell to Whangarei, the two chief *harbours* in the extreme north. The same line reappears at Drury, just south of Auckland, and runs along the Waikato valley, through Mercer and Rangiriri, to Newcastle ; and the *coal* from this district serves both the steamer and railway traffic of Auckland city itself, and the iron-works of its western port, Onehunga.

The mines in the SOUTH ISLAND are richer and even more conveniently distributed. The most valuable ones are along the northern half of the west, *i.e.* the wet, *coast*, where they are confined almost entirely to the Province of Nelson, though a little is found in Westland. The *coal* is very near the sea, and all of very excellent quality. The two great harbours are WESTPORT and GREYMOUTH. Westport exports the *coal* of Mount Rochfort, where the seams

are so high above the sea (2000 feet) that the coal has to be lowered by self-acting tramways to the railway which runs along the base of the mountain. Westport, though in no sense a good harbour, is protected from drift sand and west gales by Cape Foulwind. The level of the Grey-mouth district allows direct railway communication between the port and Wallsend, the centre of the collieries.

Excellent *coal* also exists along the SOUTH-EAST COAST, between Kaitangata and Dunedin, and between Palmerston and Oamaru ; and the great advantage of this position arises, not from the convenience for shipping the coal, but from the fact that the main line of rail from Invercargill to Christchurch *via* Dunedin runs along the coast the whole way. Between Invercargill and Dunedin there is also *coal* inland, especially at Gore and Wyndham, in the Mataura valley. Oamaru, which,—like the neighbouring “*mutton*” port of Timaru,—has been made into a good artificial harbour, has a similar inland supply from Ngapara.

Gold is also found in both islands ; but, again, the deposits in the South Island are distinctly the richer. The gold area in the NORTH ISLAND is the Coromandel Peninsula, the site of the first prospecting for gold in the colony ; and most of the *quartz* mining hitherto has been confined to that district. The centres of the industry are the towns of Coromandel and Thames. Both are on the sea, where they can import machinery and *coal* or export the metal easily and cheaply ; Thames has much the larger supply of *water* for working the diggings, while Coromandel is nearer the great *timber* district of Mercury Bay.

The **gold** in the SOUTH ISLAND is found in close proximity to the *coal*, *i.e.* in the north-west and the south-east. The north-west area is in Nelson and Westland, the south-east

area is in Otago. In NELSON and WESTLAND the mountains which shelter the plain of Nelson from the west winds are so high, so abrupt, and so near the sea, that precipitation is almost continuous and very heavy. Moreover, their slopes, both above and below the gold level, are covered with *timber*. There is, therefore, abundance of water for sluicing, and of timber for shafts, galleries, and tunnels. The chief centres in NELSON are in the basins of the Grey and Buller rivers, especially at Reefton and Lyell ; but there are also deposits at Collingwood, where the much lower level is more favourable to the import of machinery and the export of the metal. In WESTLAND the chief centres are at Kumara and Hokitika, both of which are on the sea ; and the rocks between the two places are so rich in gold that, after a storm, *nuggets* may be picked up on the beach. Of course, all along this part of the coast the mountains are so near to the sea that hydraulic mining cannot produce any devastation of rich agricultural land, as was the case in California ; and the rivers are too short and too rapid for navigation, so that there need be no hesitation in choking them with *débris*.

In OTAGO the GOLD is found mainly in the valleys of the rivers that are thrown down from the Alpine lakes, especially in the valley of the Clutha ; and, as the Clutha is said to have a volume equal to that of the *Nile*, the supply of *water* is absolutely inexhaustible. The centre of the Clutha district is Cromwell, a town of 11,000 people, where work is carried on at a height of 4000 feet. Towards the north-east of the province, where there is less abundance of water, e.g. on the slopes of Mount St Bathans and Mount Ida, there is fortunately *coal* near the mines.

NEWFOUNDLAND.

NEWFOUNDLAND itself is not much larger than Ireland, but the colony includes an area of Labrador about equal to the United Kingdom.

The chief characteristic of both the island and the mainland portions is the **EXTENT OF BROKEN ISLAND-FRINGED COAST**, which provides a series of excellent harbours, the capital of St John's being particularly good. Unfortunately, by the Treaty of Utrecht (1713) the French possess the islands of Miquelon and St Pierre, and claim exclusive fishing rights along the west coast, from C. Ray to C. St John. This is a great injustice to the colony, as it is **ESSENTIALLY A FISHING COMMUNITY**,—thanks mainly to the action of ocean currents in piling up *banks* near enough to the surface of the water to be covered with the seaweed in which fish can find food and lay eggs (*cf.* p. 27).

ONE THIRD OF THE POPULATION IS ENGAGED IN FISHING, the *cod* fishing—off the Great Banks—being more important than all the other industries of the colony put together. Next in importance is the *lobster* fishery (producing an export of £120,000 in 1897), which is the main cause of trouble with the French; and the *seal* fishery off Labrador (for oil and skins, *not* furs) comes third.

The constant fogs and the rough hilly surface make *agriculture* quite insignificant, but the **MINERAL WEALTH**

IS CONSIDERABLE. There is good *coal* in the Grand Lake district and round St George's Bay; large beds of *iron* are being worked on Bell Island, in Conception Bay; and there is excellent *copper* round Placentia Bay, which is conveniently near to the cable-terminus of Hearts-Content Harbour. There is now a *railway* right through the island, connected at Port au Basques by a steamer with C. Breton Island.

BRITISH CENTRAL AMERICA.

BRITISH CENTRAL AMERICA is a very "rough" title for THREE AREAS; (1) the mainland of British Honduras and British Guiana, (2) the British possessions in the West Indies, and (3) the Bermudas.

The BERMUDAS are a group of *coral* islands, which owe their existence—so far outside the Tropics—to the Gulf Stream, as the coral formation of Japan is due to the Kuro-Siwo (*cf.* p. 26). The Gulf Stream also gives them a *wonderful climate*, which makes Hamilton and St George favourite *winter resorts* for Americans, and which makes the islands generally a market-garden for *early vegetables* (onions, potatoes, tomatoes, etc.) for New York.

BRITISH HONDURAS AND BRITISH GUIANA consist of low, swampy plains, backed by forest-clad mountains. The lowlands grow quantities of *sugar*, especially along the Demerara, and the forests include *logwood* and *mahogany*. The chief mahogany centre is Belize, and the chief sugar centre is Georgetown.

The WEST INDIAN possessions may be divided into the *Bahamas*—low, unfertile coral islands, outside the Tropics, and the *West Indies proper*—fertile volcanic islands inside the Tropics; and the latter group may be sub-divided into (1) Jamaica, and (2) the Lesser Antilles or Windward Islands. The British Government divides the Lesser Antilles into “Windward” (St Lucia to Trinidad) and “Leeward” (the Virgins to Dominica); but the name “Leeward” is absurd for islands which are full in the teeth of the trade-winds. The chief products are *coffee*, *cacao*, *sugar* and *rum*. The *coffee* comes specially from the Blue Mountains of Jamaica, *viâ* Kingston and Port Royal; the *cacao* comes specially from Trinidad, *viâ* Port of Spain; and the *sugar* specially from Jamaica and Barbados (*cf.* “Jamaica rum”). *Fruit* is also widely grown, *e.g.* *bananas* and *pine-apples*, specially in the Bahamas, *cf.* the *limes* of Montserrat.

BRITISH POSSESSIONS IN THE PACIFIC.

The British possessions in the Pacific include (1) the Straits Settlements, (2) the Fiji Islands, (3) several isolated points such as Hong Kong, Singapore, North Borneo, etc. THE STRAITS SETTLEMENTS produce *tin*, *timber*, *spices*, etc., exported mainly *viâ* Singapore; THE FIJI ISLANDS export *sugar*, *coco-nuts* and *copra*, mainly from Suva and Levuka; and the isolated possessions are chiefly IMPERIAL FOOTHOLDS, like Aden and Malta (*cf.* p. 56), but Borneo (with Labuan) produces excellent *camboor*, *tobacco* and *coal*.

TRANSVAAL AND ORANGE RIVER COLONIES.

The two old Dutch Republics consist of a BROAD HIGH PLATEAU, with an undulating kopje-studded surface, entirely cut off from the sea by the Draken-berge. The plateau generally is known as the *Veld*, and sinks gradually from the water-parting of the Witwatersrand to the Limpopo and the Orange rivers. The Transvaal, or Limpopo slope, falls in wide terraces—the High Veld, the Middle Veld, and the Low Veld; and it has an area about twice as large as that of the Orange River Colony, or Orange Slope. The fact that the plateau falls within the *Belt of Capricorn Calms* (cf. p. 21)—i.e. has no regular winds blowing into it for at least half the year—implies that its rainfall is uncertain and limited, Bloemfontein having about 21 and Pretoria about 26 inches a year; but the nearness to the sea and the height of the Draken-berge guarantee a *fairly good river-system*, of which the Vaal is the centre. The climate is, however, too dry in most places for tree-growth, though it is very healthy and very favourable to *pasture*.

The High Veld, the highest and driest part of the Transvaal Colony, is also EXCEEDINGLY RICH IN GOLD, supplying practically the whole gold-export of South Africa (over £13,000,000 in 1899). Johannesburg, the centre of the richest deposits, has sprung up since 1885 into a city of over 100,000 persons; and it is typical of a great mining centre in a “new” country that *eighty per cent* of its population are *males*. There are also rich *gold-fields*

in the Draken-berge valleys, *e.g.* in the De Kaap district round the towns of Lydenberg and Barberton.

The Middle Veld, or "Garden of the Transvaal," is better watered, and has better soil than the High Veld, and so has become a district of "**MIXED**" FARMING; it produces specially *cattle* and *mealies* (maize), *e.g.* round Pietersburg and Nylstroom, Vryheid and Utrecht.

The Low Veld is the forested valley of the middle Limpopo, and produces plants typical of the lower level and damp heat—*coffee* and *sugar*; and *ivory* is exported from the parts which are still frequented by elephants.

The ORANGE RIVER COLONY is much more level than the Transvaal, and is too high and too dry everywhere to have any unhealthy areas such as the Low Veld; but otherwise it resembles the Transvaal Colony, being partly mining and partly farming. The mineral wealth is mainly in *diamonds*, *e.g.* near Famesmith, and *coal*, *e.g.* between Kronstad and Heilbron; the chief cattle-markets are in the Caledon valley, *e.g.* Ladybrand and Smithfield.

The RAILWAY SYSTEM is important. The main route runs in an almost direct line from Norval's Pont on the Orange River (where it joins the Cape Colony line to Port Elizabeth) to the *gold*-field of Pietersburg (*en route* for Bulawayo *viâ* Rhodes Drift and Tuli) through the pastoral and political centres of Bloemfontein and Pretoria; and it is joined at the exceedingly important junction of Elandsfontein by the line from Newcastle (Natal) *viâ* Standerton and the Heidelberg *gold*-field, and at Pretoria by the line from Delagoa Bay *viâ* Komati Poort and the Middelburg *coal*-field.

There are also some IMPORTANT BRANCH-LINES—*e.g.* from Springfontein to Bethulie, the frontier junction with

the line to East London ; from Kroonstad to the *coal*-field of Vierfontein ; from near Viljoen's Drift to the *coal*-field of Heilbron ; from Elandsfontein eastward to the Springs *coal*-field, and westward to the Witwatersrand and Klerksdorp *gold*-fields *viâ* Johannesburg, Krugersdorp, and Potchefstroom.

Besides these lines, which are actually working, the line from Ladysmith to Harrismith (past Spion Kop) is being continued to Kroonstad *viâ* Bethlehem, and the Selati line from Komati Poort is being continued to Pietersburg *viâ* Leydsdorp.

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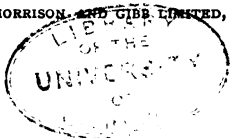
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